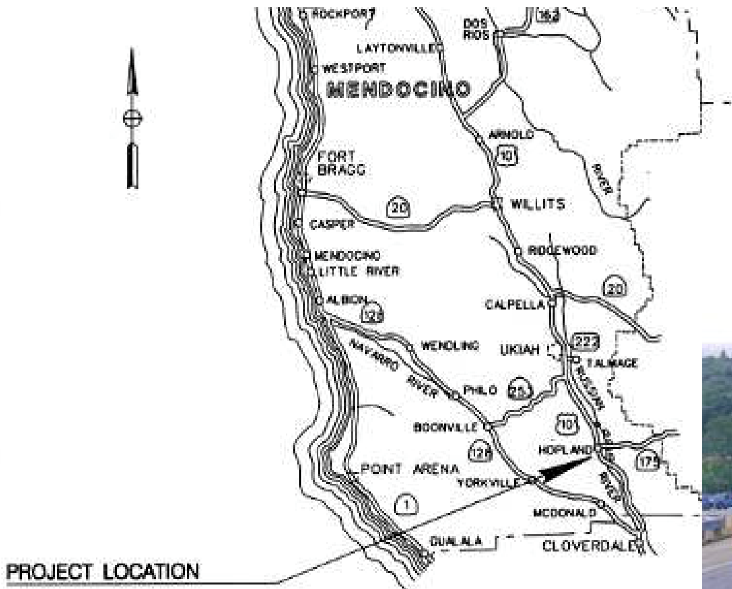
Hopland Bypass/North Hopland

Traffic Forecasting, Modeling, and Performance Study



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Office of Travel Forecasting and Modeling

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Prepared for
Caltrans District 01

Prepared by
William A. Davis, Transportation Planner
Caltrans – District 03 – North Region
Office of Travel Forecasting and Modeling
Dennis Azevedo, Office Chief

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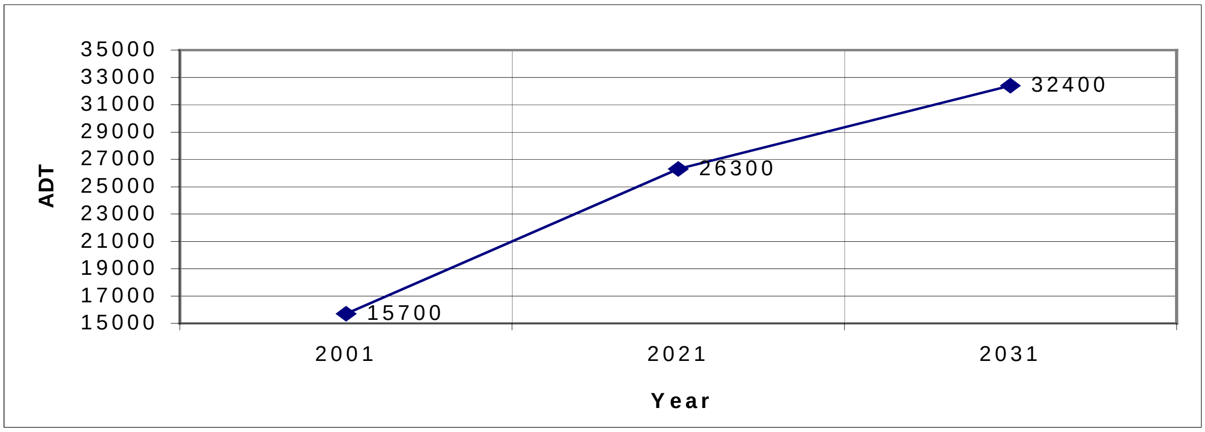
EXECUTIVE SUMMARY

This summary provides a brief overview of the conclusions and results of the traffic forecasting, modeling, and performance study of the Hopland Bypass/North Hopland Project. The purpose of the project is to improve the performance of interregional traffic flows, reduce congestion in Hopland, and improve safety. This study analyzed and modeled the performance of the Base Year (2001) traffic network, the 2021 and 2031 No-Build (No Bypass) alternatives, and the Build alternatives (e.g., VE2/VW2, VW3, VE3, etc.).

The traffic forecast for this study is based on the Route 101 Corridor Traffic Model, developed by Dowling Associates for the Mendocino Council of Governments (September 2001). The model output was used in conjunction with linear regression to develop a traffic forecast to the year 2031. Based on the forecast, Average Daily Traffic (ADT) on US 101 is expected to more than double by the year 2031 (See Figure 1).

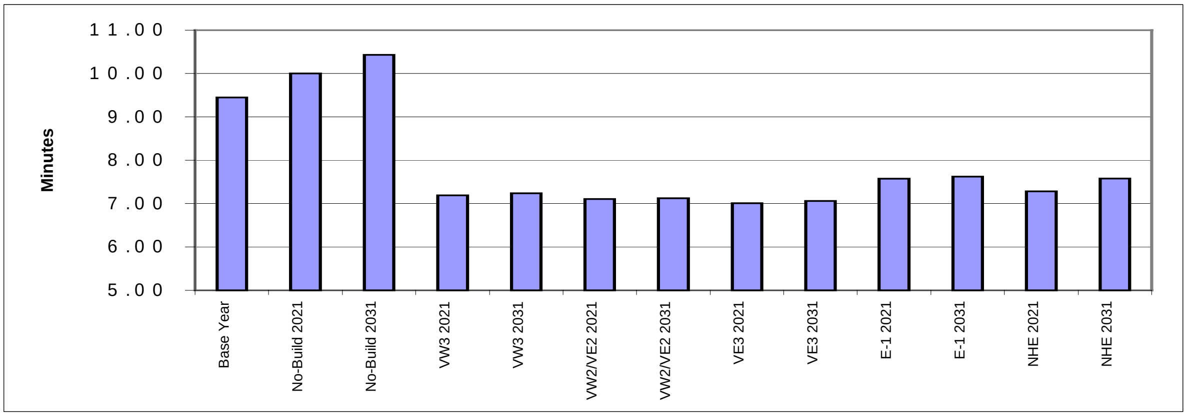
Figure 1 – Forecasted Average Daily Traffic (ADT) – US 101



Without a Bypass congestion in Hopland will get progressively worse and travelers on US 101 will experience a decline in level of service. Existing US 101 is a two-lane highway through Hopland with some passing lanes segments north of Hopland. Current Level of Service (LOS) ranges from LOS "C" to "E" in and around Hopland. In the future, without a bypass, LOS "E" will predominate the route.

Without a Bypass peak hour travel time on US 101 between Post Mile 8.9 (Eastside Road) and Post Mile 16.5 (Henry Station Road) will increase from a current average of 9.45 minutes to 10.43 minutes in 2031. All of the proposed freeway Bypass alternatives will be able to maintain a LOS "B" and decrease travel time by up to 3.3 minutes (see Figure 2). A freeway bypass combined with a North Hopland Expressway will have travel times slightly higher than most of the full freeway alternatives.

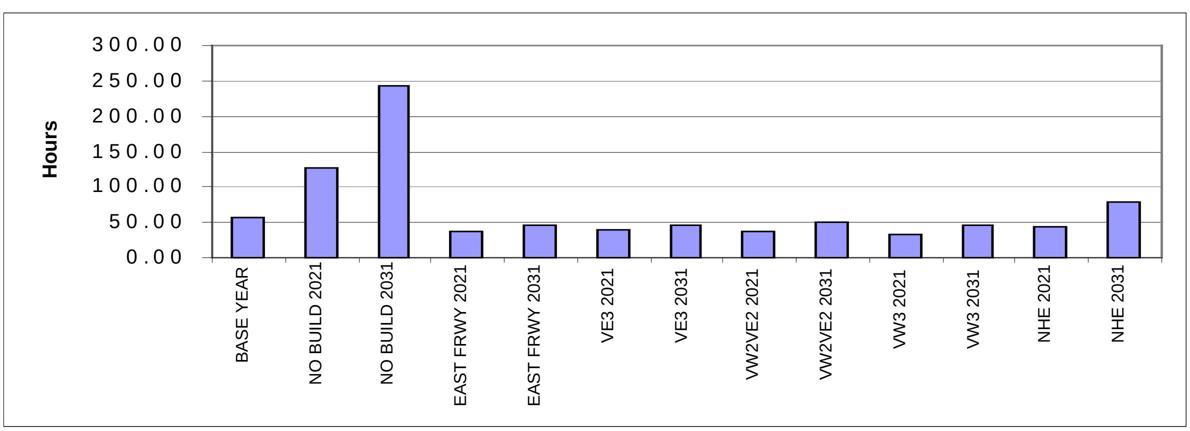
Figure 2 – Average Travel Time – US 101



Average daily traffic in 2031 is projected to be about 32,000 vehicles per day. An Origin and Destination (O/D) study, completed for this project, estimates that about 70 percent of the traffic on US 101 is interregional traffic that passes through Hopland without stopping for goods or services. At a minimum in 2031, a freeway bypass around Hopland will save an average 2 minutes in travel time for all daily interregional traffic. Cumulatively, interregional traffic would save about 44,800 minutes or about 750 hours per day. Annually that represents a timesaving of over 270,000 vehicle hours.

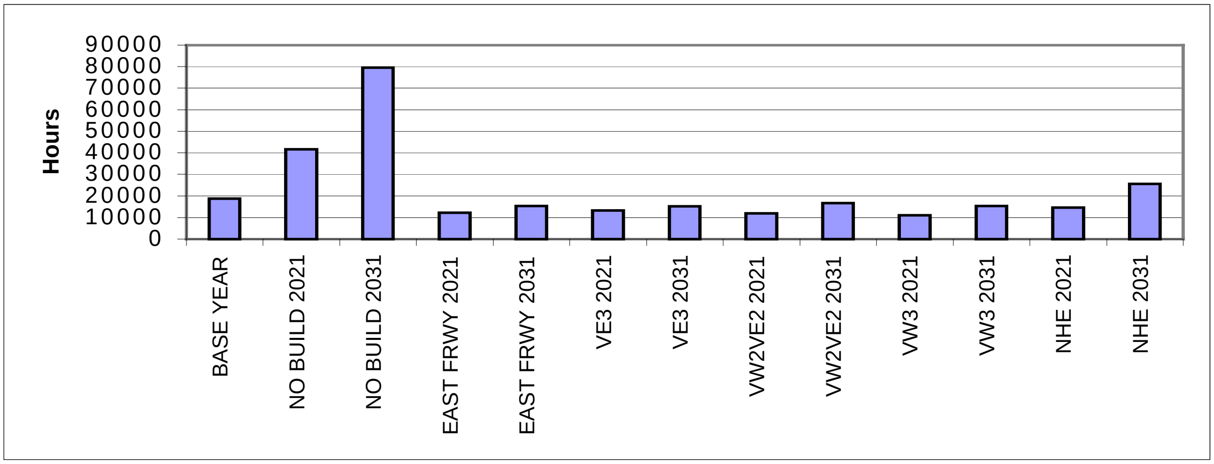
As indicated in Figure 3, peak hour delay in the Hopland study area is expected to increase by over 180 hours without a bypass. Peak hour delay is the cumulative effect of delay due to congestion and stop control delay for all vehicles in the study network. As illustrated, all of the proposed freeway bypass alternatives would reduce peak hour delay to below base year levels, except the North Hopland Expressway combined with a freeway bypass would have about 20 hours more delay in 2031 than the base year.

Figure 3 – Peak Hour Delay



Peak hour delay was derived from simulation results for an average peak month/peak hour. Average annual daily peak hour volumes are about 90% of peak month/peak hour volumes. A rough estimate of annual peak hour delay can be derived by multiplying the total peak month/peak hour delay by .9 and then multiplying the result by 365 days. The results of this calculation are shown in Figure 4.

Figure 4 – Annual Peak Hour Delay



The generalized conclusions of the study are that without a bypass system delay will become excessive, level of service will be unacceptable, and travel times will increase. A bypass will address these issues plus ensure downtown Hopland is safe for pedestrians and local traffic.

I. INTRODUCTION

BACKGROUND

US 101 is one of the longest north/south facilities in the State. It begins in Los Angeles County in the south and ends at the Oregon border in the north. It traverses multiple municipal and county jurisdictions as it meanders through the coastal mountain ranges of the State. The route is comprised of several facility types including freeway, expressway, multi-lane and two-lane highways. In downtown San Francisco, US 101 is a large urban arterial that provides access to the Golden Gate Bridge. It is the major commuter link between San Francisco and North Bay Area communities.

North of the Bay Area, US 101 is the primary roadway serving Marin, Sonoma, Mendocino, Humboldt, and Del Norte Counties. Route 101 is considered to be the economic lifeline of the north coast. It is designated as a high emphasis focus route in the State Interregional Transportation Strategic Plan (ITSP).

PROJECT VICINITY

Several small and medium sized communities exist along US 101 between the North Bay Area and the far north coastal regions. Hopland is one of these communities (See Figure I-1, Location Map). Hopland is located in Mendocino County approximately ten miles north of the Mendocino/Sonoma County line. Hopland is a small, rural community comprised of several small stores, shops, restaurants, gas stations, and small-scale residential development. Vineyards and orchards, interspersed with rural residential development, dominate the landscape of the Sanel Valley surrounding Hopland. Many vintners and several nationally known wine producers have chosen the valley as home.

Old Hopland lies just east of Hopland on SR 175. The primary attraction in Old Hopland is the Fetzer Winery, located at the intersection of SR 175 and Eastside Road. Several miles east of Old Hopland, on SR 175, is the Hopland Shokawa Indian Casino. SR 175 continues on as a small, winding two-lane road over the hills that separate Lake and Mendocino counties. Although SR 175 provides a direct link between Clear Lake and US 101 in Hopland, it is not heavily traveled because of steep grades, hairpin turns, narrow lanes, and a restriction on vehicles greater than 39 feet in length.

Eastside Road is a two-lane road that parallels US 101 on the eastside of the Russian River. Eastside Road begins just south of Hopland, joins SR 175 for a short distance through old Hopland, and continues on north for several miles to Ukiah. Eastside Road provides access to a Fetzer winery bottling facility, a UC Extension facility, small-scale wineries, and residential development on the east side of the valley.

STUDY AREA

The study area begins at Mendocino County US 101 Post Mile (PM) 8.80 south of Hopland and extends north to PM 17.60 (See Figure I-2). Existing primary intersections along this segment of SR 101 include Eastside Road, Mountain House, SR 175 (Hopland Road) and Henry Station. SR 175 is included in the study area extending from PM 0.00 to PM 2.0 The following SR 175 intersections are also included in the study area – SR 175/Eastside Road south and SR175/Eastside Road north.

The study area also includes the locations of the proposed Bypass alternative alignments with various freeway interchanges that connect to the existing surface street system (See Figure I-3).

STUDY PURPOSE

The Traffic Forecasting and Modeling study is designed to provide a comparison between existing traffic conditions and future traffic conditions with the Bypass (Build scenario) and without a Bypass (No-Build scenario). The comparison will focus on measures of effectiveness such as average speed, overall system delay, and Level of Service to gauge the efficiency of the traffic system under existing conditions and the proposed alternatives.

This is a planning level study, which is not designed to replace a traffic operations study. Specific design issues such as the appropriate length of ramps, turn pockets, tapers, etc., will be addressed when a preferred alternative is selected.

Figure I-1 - Location Map

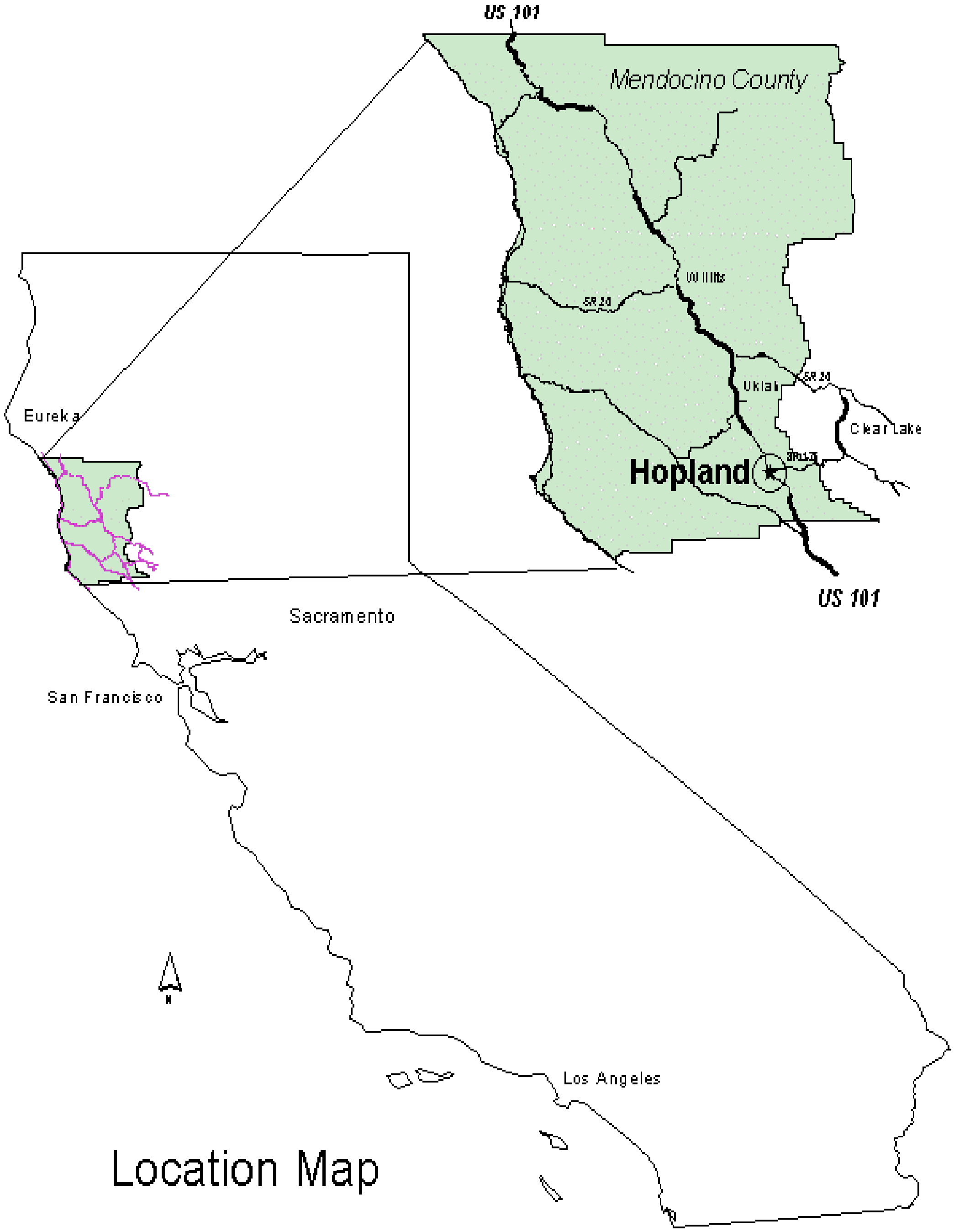
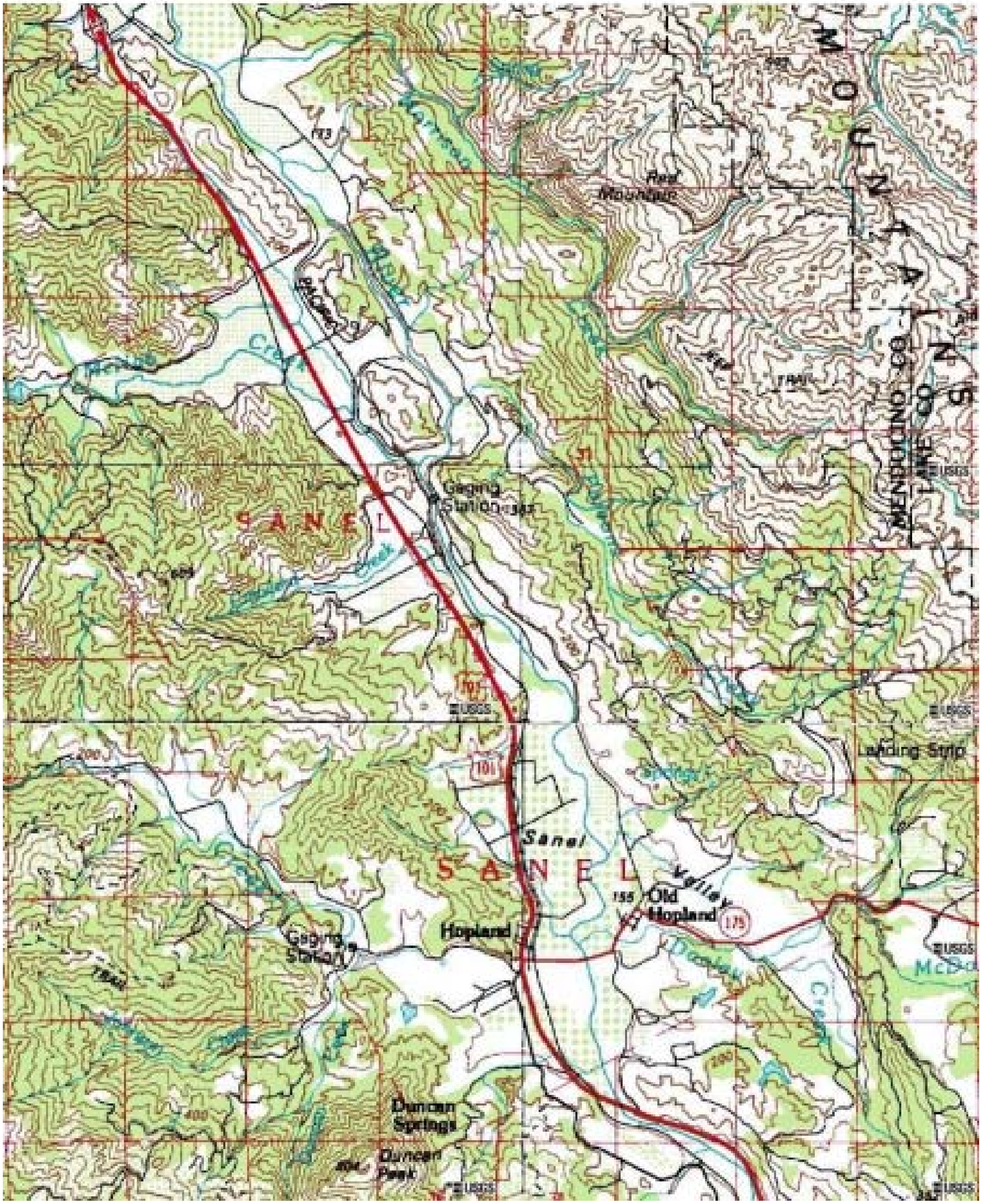


Figure I-2 - Project Study Area



PROJECT DESCRIPTION

US 101 is a two-lane rural highway through Hopland, and it is Hopland's main street. Increased demand for interregional travel, and growth along the northern US 101 corridor, has resulted in increased traffic through Hopland. Local projections for future growth indicate that this trend will continue at an accelerated rate over the next few decades. Although US 101 through Hopland is primarily an interregional travel route, the current capacity of the facility is significantly reduced by an "in-town" speed limit of 35 mph which was implemented due to safety concerns because of on-street parking and pedestrian activity.

Capacity constraints, projected traffic increases, and safety concerns on US 101 have prompted past, current, and planned improvements to US 101 north and south of Hopland. Currently, a segment of US 101 just south of Hopland is being improved from two-lane highway to 4-lane expressway, and approximately seven miles north of Hopland US 101 is already a full 4-lane freeway.

The Hopland Bypass/North Hopland project proposes a new 4-lane freeway that would bypass the community of Hopland (See Figure I-3). The project also proposes a North Hopland 4-lane expressway or freeway to connect the Hopland Bypass to the existing freeway south of Ukiah. Five alternative freeway alignments have been proposed for the Hopland Bypass, and three alternatives, including one expressway, are proposed for the North Hopland segment.

<u>Valley East 2 (VE2) Alternative</u>: VE2 begins about 1 mile south of the existing East Side Road/Route 101 intersection. It roughly follows the existing alignment for approximately a half-mile where it connects to the South interchange. After the South interchange, the alignment curves to the north, proceeds north through the Sanel Valley where it crosses Route 175. VE2 then turns northwest crossing the Russian River. The alignment crosses over to the west side of existing Route 101, and proceeds toward the Sundial Interchange. After the interchange, the new alignment roughly follows the existing alignment where it connects to the North Hopland segment.

<u>Valley East 3 (VE3) Alternative</u>: VE3 begins about one-quarter mile south of the existing East Side Road/Route 101 intersection. The alignment immediately curves to the north up the Sanel Valley where it continues to an interchange at Route 175. After the Route 175 interchange, the alignment curves to the northwest, crosses the Russian River and existing Route 10, until it reaches the Sundial Interchange. After the Interchange, the new alignment roughly follows the existing alignment where it connects to the North Hopland segment.

<u>Valley West 2 (VW2) Alternative</u>: VW2 begins about 1 mile south of the existing East Side Road/Route 101 intersection. It follows existing the US 101 alignment for approximately one-half mile, at which point it turns to the north, allowing room for the South interchange. After the South interchange the alignment continues west crossing East Side Road and the Russian River, parallel to the existing Russian River bridge, and then curves northward up the Sanel Valley crossing over Feliz Creek and Route 175. VW2 alignment then crosses over existing Route 101 north of Hopland, proceeding north to the Sundial Interchange, located about 200 M to the west of existing Route 101 along the Sundial ranch road. After the Interchange, the

new alignment roughly follows the existing alignment where it connects to the North Hopland segment.

Valley West 3 (VW3) Alternative: VV3 begins about one-quarter mile south of the existing East Side Road/Route 101 intersection. The alignment continues west following the existing US 101 alignment, then diverges to the Feliz Interchange. The alignment continues north, skirting to the eastern edge of downtown Hopland and crosses over Route 175. Just north of Hopland the alignment curves to the west, crosses existing Route 101, and proceeds north to the Sundial Interchange. After the Interchange, the new alignment roughly follows the existing alignment where it connects to the North Hopland segment.

East Freeway (E-1) Alternative: E-1 begins about 1 mile south of the existing East Side Road/Route 101 intersection. It follows existing the US 101 alignment for approximately one-half mile, at which point it turns to the north, allowing room for the South interchange. After the interchange, the alignment proceeds northeast through rolling terrain crossing Dooley Creek towards an interchange at Route 175. E-1 then curves to the northwest skirting the hills to the east of the Sanel Valley, eventually turning west to cross the Russian River. The alignment descends to an interchange near the existing California Department of Forestry (CDF) station where it connects to the North Hopland segment.

North Hopland Alternatives

All North Hopland Freeway alternatives begin at the northern terminus of the Hopland Bypass project, include an interchange at Henry Station Road (McNab Interchange) and roughly follow the existing alignment of US 101. The primary difference between these alignments is that NHF1 maintains old US 101 as frontage road at the northern end of the alignment and NHF2 eliminates old US 101 as a frontage road. Minor changes in the distribution of traffic results from eliminating old US 101 as a parallel frontage road.

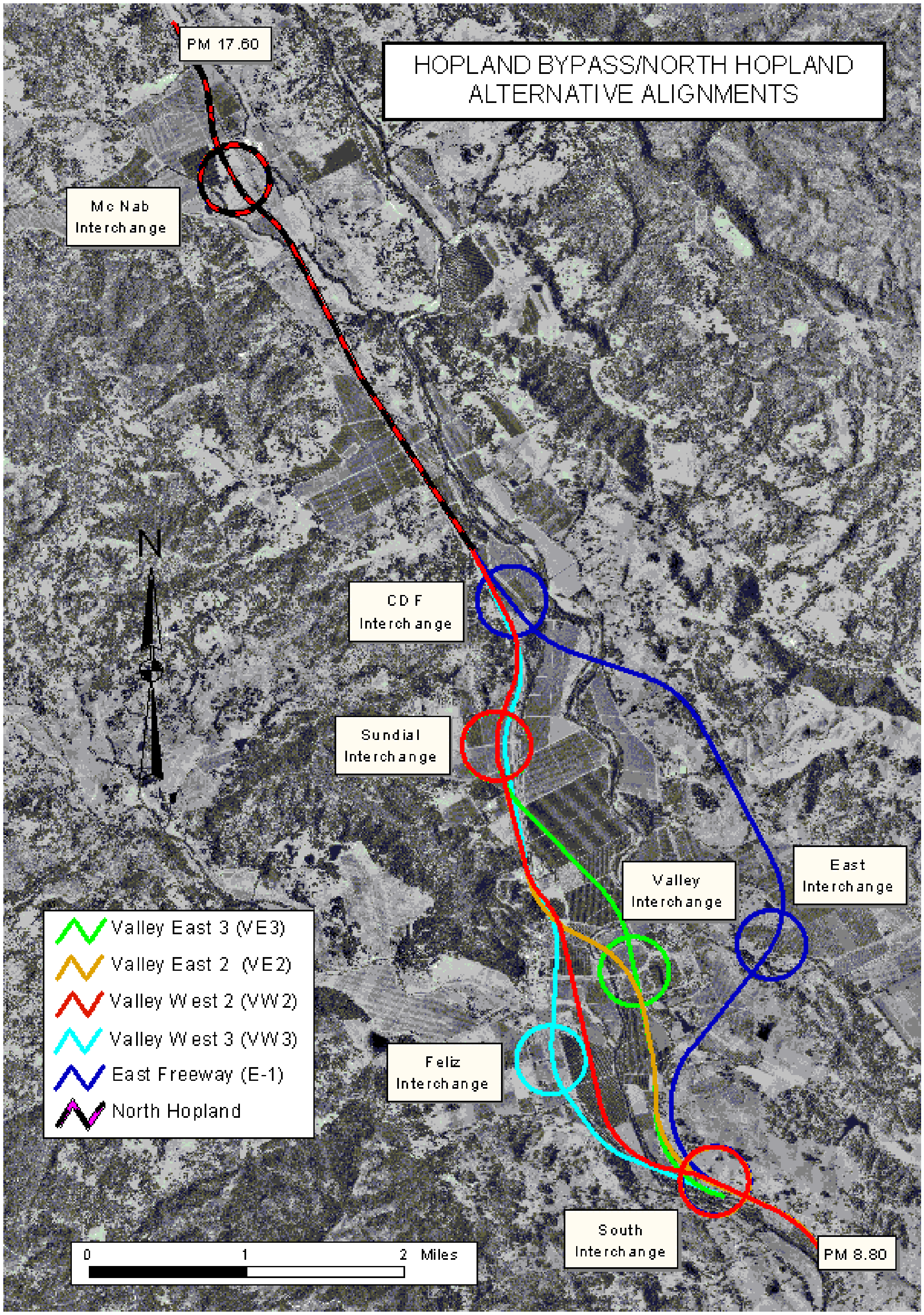
North Hopland Expressway (NHE) Alternative: The NHE is a four-lane, at-grade expressway that begins at the northern terminus of the Hopland Bypass project. The expressway follows the existing US 101 alignment and includes several at-grade intersections.

North Hopland Freeway (NHF) Alternative: The NHF alternative is four-lane freeway that maintains existing alignment of Old US 101 as frontage road along the entire length.
North Hopland Freeway 1 (NHF1) Alternative: The NHF1 alternative is four-lane freeway that maintains existing alignment of Old US 101 as frontage road up to the McNab IC were it is rerouted to the west of the freeway.

North Hopland Freeway 2 (NHF2) Alternative: The NHF2 alternative is four-lane freeway that follows existing alignment of Old US 101 which eliminates the use of US 101 as a frontage road towards the north central portion of the alignment.

The locations of the Hopland Bypass/North Hopland alternatives are illustrated in Figure I-3.

Figure I-3 - Hopland Bypass/North Hopland Alternatives



II. METHODOLOGY

TRAFFIC DATA COLLECTION

Traffic Census/Historical Data

Caltrans Traffic Census Department compiles and maintains publicly available historical traffic data (1970-2001 Traffic Volumes on California State Highways) and truck volume (1992-2001 Truck Traffic on California State Highways) data for all state highways. Traffic data for US 101 in the study area was reviewed for this project. The purpose of this review was to establish the appropriate time to conduct traffic counts that provide the starting point for base year traffic analysis.

It is recommended by the Highway Capacity Manual (HCM 2000) that a traffic analysis hour be chosen that falls somewhere between 30th and 100th highest traffic volume hour. Review of the historical traffic data US 101 indicates that weekdays in the peak summer traffic months would have peak hours of traffic that would fall within the 30th to 100th hour range. Some weekend days have peak traffic hours that would also fall within this range; however, holiday weekend traffic volumes can be much higher and have ranks that fall between the 1St and 29th hour. Weekend traffic also does not normally contain the same mix of vehicles as weekday traffic. For design and analysis purposes it is important that Peak Hour truck traffic be accurately represented because of the performance differences between passenger cars and trucks.

For the purposes of this study, it was decided that an average Friday in a peak travel month would best capture the 30th to 100th hour criteria, and would better represent the regularly reoccurring traffic conditions on the route. It would also provide a better mix of passenger cars, trucks, and recreational vehicles using the route.

Traffic Census data (Caltrans Truck Traffic on State Highways) was also used to establish the truck volumes on the route. Based on this data it was determined that this segment of US 101 has an average 9% Peak Hour truck traffic when compared to Average Annual Daily Traffic (AADT).

Traffic Counts

Collecting traffic count data establishes base year traffic conditions to be used in the traffic analysis. Traffic counts for the Hopland Project were conducted during the peak travel months of May and July of 2000. Additional counts were collected in October of 2001 to verify and update the 2000 data. Counts were recorded at the following locations in the Hopland Bypass Project study area:

- US 101 at Eastside Road
- US 101 at Mountain House Road
- US 101 at SR 175 (Hopland Road)
- US 101 at Post Mile 11.25
- US 101 at Henry Station Road

- US 175 (Hopland Road) at Eastside Road (Fetzer Entrance)
- US 175 (Hopland Road) at Eastside Road (Northeast of Old Hopland)

Individuals were stationed at the above locations to visually count vehicles as they passed, and to record turn movements at the intersections. Morning (AM), afternoon (PM), and all-day counts on weekdays and weekend days were completed for the project. The count data was then compiled, reviewed, and interpreted. The data revealed the weekday Peak Hour (highest one-hour volume of traffic) normally occurred between 4PM and 5PM. The Friday PM Peak Hour tended to have slightly higher traffic volumes than other weekdays and contained a representative mix of passenger cars, trucks, and recreational vehicles.

Origin and Destination Study

It was determined that it would be useful to the Hopland project to establish how much interregional traffic moves through Hopland and how much of the traffic is local. Estimating the ratio of interregional traffic to local traffic would assist in predicting the benefit of a Bypass. An Origin and Destination (O/D) Study can provide this information; however, a comprehensive O/D study requires that drivers be stopped on the highway and asked where are they coming from, where are they going, and what route they are taking. This can be a time-consuming, inconvenient, and an invasive process for drivers. It was also considered to be infeasible and unsafe to stop traffic on a major highway such as US 101.

A less invasive technique uses video cameras to record vehicles as they pass entry and exit points in a network. A video camera study does not provide as much information as comprehensive O/D study, but it does provide a tool to estimate travel patterns and the types of vehicle trips in a study network.

The Hopland Video O/D Study was conducted on Friday, May 19, 2000 – between the hours 2PM and 6PM. Six video cameras at 3 entry points and 3 exit points were used in the study (See Figure II-1 for camera locations labeled “A” through “F”). Cameras were setup to capture vehicles (license plates) as they entered or exited Hopland on US 101 and SR 175. The videotapes were viewed at a later date when vehicle license numbers with the time of day were recorded and entered into databases for each video camera location.

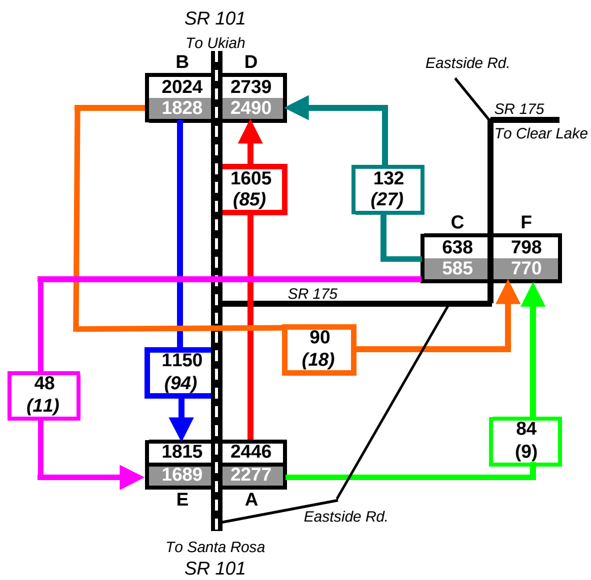
The data was initially compared and sorted by the number of times a unique license was identified at the each location. All licenses videotaped once, twice, three times, four times or more at each location were separated into individual databases.

Figure II-1

HOPLAND BYPASS PROJECT - EA 01-2921U0

Origin and Destination Study Summary

Study Date and Time: Friday - May 19, 2000 - 2:00PM TO 6:00PM



Video Camera Locations

Origins

- **A** SR 101 Northbound - South of Hopland
- **B** SR 101 Southbound - North of Hopland
- **C** SR 175 Westbound - Old Hopland

Destinations

- **D** SR 101 Northbound - North of Hopland
- **E** SR 101 Southbound - South of Hopland
- **F** SR 175 Eastbound - Old Hopland

Video Capture Data

Vehicle Passes Captured	10,460	100%
Vehicle Licenses Identified	**9,639**	92%
Unidentified Licenses	821	8%
Unique Vehicles Identified	5,427	52%

Origin and Destination Data

Origin Vehicle Licenses Identified				
	A	B	C	
	2277	1828	585	4690
Destination Vehicle Licenses Identified				
	D	E	F	
	2490	1689	770	4949
			Total Identified O & D	**9639**
			Matched O & D (1 Origin-1 Dest.)	6972
			Multiple Matched O & D (>2 Orig. or Dest.)	991
			Unmatched O & D	1676
		O without D	*724*	
		D without O	*952*	
			Total Identified O & D	**9639**

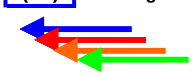
LEGEND

XXX	**XXX**
XXX	**XXX**

ALL Vehicle Passes
Identified O & D Vehicle Licenses

XXX
(XX)

Through Trips < 10 Minutes
Through Trips > 10 Minutes



Origin to Destination Path

Through Trips (1 Origin/1 Destination)

Origin	Dest.	<10 Min.	>10 Mins.	Total
A	D	1605	85	1690
B	E	1150	94	1244
A	F	84	9	93
B	F	90	18	108
C	D	132	27	159
C	E	48	11	59

[1] Unmatched O and D

Origin		Dest.	
A	328	D	377
B	226	E	218
C	170	F	357

[2] Unidentified License O and D

Origin		Dest.	
A	190	D	254
B	203	E	94
C	51	F	29

1 - Vehicle License only identified once at an Origin or Destination.
(It is assumed that >75% of unmatched O & D are local trip ends.)
2 - Vehicle passes recorded at a specific Origin or Destination without License ID.
(These vehicles could be either local or through trip ends)
3 - Vehicles identified more than twice are assumed to be making local trips
4 - Persons on these trips are assumed to be utilizing services in Hopland
while in-route of a through trip (e.g., stops for lunch, etc.)

[3] Unique Vehicles Passing an Origin and/or Destination More Than Twice As A Percent Of Total Identified Origin and Destination

Origin	**Total**	3 Passes		4 Passes		5 Passes	
A	2277	37	2%	89	4%	8	0.4%
B	1828	59	3%	111	6%	31	2%
C	585	61	10%	59	10%	33	6%
Dest.	**Total**	3 Passes		4 Passes		5 Passes	
D	2490	63	3%	118	5%	32	1%
E	1689	46	3%	85	5%	5	0.3%
F	770	58	8%	62	8%	34	4%

Through Trips Less Than 10 Minutes in Length As A Percent of Total Identified O & D

Origin	**Total**	**O-D**	**Trips**	**%**	**O-D**	**Trips**	**%**
A	2277	**A**-D	1605	**70%**	**A**-F	84	**4%**
B	1828	**B**-E	1150	**63%**	**B**-F	90	**5%**
C	585	**C**-D	132	**23%**	**C**-E	48	**8%**
Dest.	**Total**	**O-D**	**Trips**	**%**	**O-D**	**Trips**	**%**
D	2490	A-**D**	1605	**64%**	C-**D**	132	**5%**
E	1689	B-**E**	1150	**68%**	C-**E**	48	**3%**
F	770	A-**F**	84	**11%**	B-**F**	90	**12%**

[4] Through Trips More Than 10 Minutes in Length As A Percent of Total Identified O & D

Origin	**Total**	**O-D**	**Trips**	**%**	**O-D**	**Trips**	**%**
A	2277	**A**-D	85	**4%**	**A**-F	9	**0.4%**
B	1828	**B**-E	54	**3%**	**B**-F	18	**1%**
C	585	**C**-D	27	**5%**	**C**-E	11	**2%**
Dest.	**Total**	**O-D**	**Trips**	**%**	**O-D**	**Trips**	**%**
D	2490	A-**D**	85	**3%**	C-**D**	27	**1%**
E	1689	B-**E**	54	**3%**	C-**E**	11	**1%**
F	770	A-**F**	9	**1%**	B-**F**	18	**2%**

The databases of licenses only identified once were compared and matched based on entry and exit locations. For instance, a license identified only once entering Hopland at location "A" (US 101 northbound south of Hopland) would be identified only once exiting at location "D" (US 101 northbound north of Hopland). It could be inferred that because the license was only identified once entering and once exiting Hopland that the vehicle traveled through Hopland on US 101 northbound. Time of day was also compared, and it was assumed that if a license was identified as exiting Hopland within ten minutes of entering Hopland it was a through (interregional) trip that did not stop.

This type of comparison and matching was completed for all licenses that were identified at each location. The generalized results of the comparison and matching are as follows:

- 70% of northbound US 101 traffic continued northbound and did not stop or have destinations in Hopland. This was assumed to be interregional through traffic.
- 63% of southbound US 101 traffic continued southbound and did not stop or have destinations in Hopland. This was assumed to be interregional through traffic.
- 4% of northbound US 101 traffic did not stop or have destinations in Hopland, turned eastbound on SR 175 and was assumed to be interregional through traffic.
- 5% of southbound US 101 traffic did not stop or have destinations in Hopland, turned eastbound on SR 175 and was assumed to be interregional through traffic.
- 23% of westbound SR 175 traffic did not stop or have destinations in Hopland turned northbound on US 101 and was assumed to be interregional through traffic.
- 8% of westbound SR 175 traffic did not stop or have destinations in Hopland turned southbound on US 101 and was assumed to be interregional through traffic.
- The remainder of the traffic consisted of local trips with destinations in or around Hopland.

Figure II-1 contains a diagram and tabular summary of the data collected, compared, and analyzed. The data was used to assist in distributing the traffic properly in the study network in the forecast years

Field Observations

Field observations were conducted in Hopland in conjunction with the May-June 2000 and October 2001 traffic counts and the O/D Study. Observations focused on pedestrian activity, vehicle movements, on-street parking activity, and general traffic conditions.

Pedestrian activity in Hopland peaked between the hours of 10am and 4pm. The highest observed pedestrian activity occurred between 12 noon and 3pm with as many as 30 pedestrians per hour crossing US 101. After 4pm, pedestrian activity dropped off to about 10 pedestrians per hour. Between 6pm and 7pm, pedestrian activity was minimal with less than 5 pedestrians per hour.

Vehicle trips that did not stop, as verified by the O/D study, made up the majority of the traffic in Hopland. When vehicles did stop in Hopland it was primarily at the Superette market, Exxon gas station, hardware store, and to a lesser degree the Bluebird restaurant, bakery, brewhouse, and other commercial enterprises. There is on-street parking on US 101 in Hopland. Many of the vehicles stopping in Hopland utilized the on-street parking. Occasionally, vehicles attempting parking maneuvers slowed or momentarily stopped traffic on US 101.

The overwhelming impression the observers had of the traffic moving through Hopland is that drivers routinely traveled in excess of the 35-mph speed limit. Local shopkeepers and residents echoed these observations during informal interviews.

In general, traffic on US 101 was observed to move deliberately through Hopland without major congestion; however, vehicles traveling in platoons were commonplace. Truck traffic was a major cause of platooning. Vehicles attempting to make left turns from SR 175 (Hopland Road) and Mountain House Road were impeded by platoons. During peak traffic hours, queues of up to 10 vehicles were observed waiting to turn left from SR 175 to southbound US 101. Smaller queues were observed on Mountain House Road.

The above observations assisted in developing the stick diagrams and in calibrating and validating the microsimulation models.

Tachographic Data Collection

Stopwatch tachographic runs were conducted to establish free-flow speeds of traffic on US 101 during off-peak periods and average speed during peak hours. A tachographic run essentially entails measuring the amount of time it takes to traverse a given distance. Average speed can be extrapolated from the elapsed time and distance traveled.

Free-flow speed during non-peak hours, derived from tach runs, indicated that drivers were traveling at or above the posted speed limits. This is especially true in downtown Hopland where drivers routinely exceed the posted 35-mph speed limit. During the peak hour speeds were lower mainly due to trucks causing platoons which slowed vehicles down; however, average speeds in downtown Hopland were still slightly higher than the posted speed limit.

The data gathered from the tachographic runs were used to calibrate the Base Year microsimulation model.

TRAFFIC FORECAST

Forecasting Process

The distribution of future traffic in a study network is extrapolated from data such as existing traffic counts, travel demand models, origin and destination studies, growth factors, linear regression, and modeling. This data is used to forecast future traffic volumes under "no-build" (e.g., no bypass) conditions and redistributed under "build" (e.g., with bypass) conditions. Stick diagrams are created and traffic flows are balanced between entry and exits points of the network. Turn movement volumes are adjusted using base year volumes as a guide. The reasonableness of the forecasted turn movements is checked through comparison of origins and destinations, and local trips versus regional trips are accounted for in the process. Other factors such as potential future land use, development patterns, and special traffic generators affect how traffic is distributed in the network. Professional judgement is important part of the iterative process used to distribute traffic.

Draft traffic stick diagrams are used as the basis for building micro-simulation traffic models of each alternative. The models replicate vehicle behavior, traffic conditions, and traffic flows. Simulation animation and outputs are used to validate the results. Adjustments are made to the draft stick diagrams where the model reveal issues of capacity or delay which prevent vehicles from progressing efficiently in the network. . The primary rule in distributing traffic in a network is that traffic will normally follow a path of least resistance and cost. The volumes are adjusted in the models and simulations re-run and the results analyzed for reasonableness based on the inputs. Once again, through an iterative process, the volumes on the stick diagrams are adjusted based on model results.

The following sections discuss the factors that were considered when completing the Hopland Bypass Travel Forecasting and Modeling Study. The following discussions can only cursively address the steps used in creating traffic forecasts. Forecasting is an analytical process rather than a purely quantitative process. It requires prerequisite knowledge and understanding of traffic flow theory, macro-and micro modeling logic, capacity analysis, land-use planning, driver behavior, and a multitude of other factors that can effect trip generation, trip distribution, and trip assignment in the forecast years.

Travel Demand Model

A travel demand model was used as the starting point for the traffic forecasts for the Hopland Bypass project. Travel demand modeling is based on the four-step modeling process: Trip Generation, Trip Distribution, Mode Split, and Trip Assignment. In simplified terms, a travel demand model uses demographic data (e.g., population, employment, etc.) aggregated in zones (e.g., census tracts, etc) to estimate the amount of traffic generated by those zones. The zones represent origins and destinations in a traffic network. The model assigns traffic from the zones to various roadways in the network based on the shortest paths between the zones.

In the forecast years, the inputs to the model are adjusted based on projected increases in population and employment which corresponds to an increase in traffic generated by the zones. The primary output of a travel demand model is a schematic diagram of a traffic network with traffic volumes traveling between zones illustrated on the roadways.

The Final Report/Model Documentation - Route 101 Corridor Traffic Model (September 2001), prepared by Dowling Associates for the Mendocino Council of Governments, provides an overview of a travel demand model developed for US 101 corridor in Mendocino County. The model area encompasses US 101, and intersecting roadways, from south of Hopland to north of Willits. The documentation includes the inputs/outputs for the Quick Response System (QRS) software used to model the corridor. Inputs for the model included existing and forecasted demographic data, trip generation rates, trip types, and other data. Output from the model runs include schematic traffic network diagrams of a 1997 calibrated Base Year, and the forecast years of 2005, 2010, 2020. The diagrams illustrate the Average Daily Traffic (ADT) volumes on the roadways included in the model.

The ADT output from US 101 Corridor model, specifically those ADT values at the primary entry points to study network, provided the core forecasted traffic volumes for the Hopland Bypass project. ADT values predicted by the model for minor roadways were also evaluated and considered in the forecast; however, predicted ADT on minor routes generally are not as accurate as those for major travel routes.

Linear Regression

The model results and forecast years provided by the Route 101 Corridor Model do not coincide with the forecast/analysis years for the Hopland Bypass Project - the Base Year – 2001, the Design Year- 2031, and an interim year - 2021. A method was needed to reconcile these differences to assist in producing a reliable forecast for the project.

Linear regression provides a method to use known values to develop a trend line to forecast/predict unknown values. The travel demand model provided us with known Average Daily Traffic (ADT) values for 1997, 2005, 2010 and 2020. Traffic counts conducted in 2000 and 2001 provided additional data. Linear regression (using Microsoft Excel) was applied to the count data and forecasted ADT values of US 101 traffic north and south of Hopland, and to SR 175 ADT values east of Hopland. The trend line that resulted was used to forecast the 2021 and 2031 ADT values needed for this study.

K-Factor

Peak Hour traffic volumes are a necessary input for performance, Level of Service, and microsimulation analysis of a traffic network. Existing Peak Hour traffic volumes for the Hopland project were obtained from actual traffic counts during several peak traffic periods. Forecasted Peak Hour volumes had to be extrapolated from the forecasted ADT values.

Peak Hour traffic can be expressed as a percentage of ADT. This is known as the Design Hour volume or K-factor. For instance, if a highway had an ADT of 10,000 vehicles per day and a K-Factor of 0.09, the Peak Hour volume would be 900 vehicles per hour (10,000x0.09). The Highway Capacity Manual indicates that K-Factors on rural and urban highways can vary, but typically range between 0.09 and 0.10. A general observation that has been made is that K-Factors tend to decrease as facility volumes increase and local roads tend to have K-Factors that are higher than highways.

Based on historic data from Caltrans Traffic Census and data obtained from traffic counts, the K-Factor for US 101 through Hopland is estimated to be approximately slightly higher than 0.09 or 9% of ADT. It is estimated that the Freeway Bypass will have a K-Factor of approximately 0.09 in the future; however, local roads will have K-Factors estimated to be 0.11.

These K-factors were applied to the demand model/regression ADT volumes to establish the PM Peak Hour traffic volumes in the forecast years for US 101 traffic north and south of Hopland, and for SR 175 east of Hopland.

Directional Split

A K-factor only estimates how much total traffic would be on a roadway during the Peak Hour. It does not specify how much traffic is moving in each direction. Directional Split identifies the proportion of traffic traveling in opposite directions on a roadway. A roadway with a directional split of 55/45 would have 55% of the traffic traveling in one direction and 45% of the traffic traveling in the opposite direction.

Historical data obtained from Caltrans Traffic Census indicted that PM Peak Hour directional split was estimated to be 60/40, with 60% of the traffic traveling northbound and 40% of traffic traveling southbound. The traffic count data collected in 2000 and 2001 showed directional splits between 56-59% northbound and 41-44% southbound on US 101. SR 175 east of Old Hopland had directional splits between 54-61% eastbound and 39-46% westbound.

A directional split value within the range of values outlined above was applied to the PM Peak Hour roadway volumes to establish directional volumes for primary roadways in the forecast years. The directional split information was primarily used at the entry and exit points to study network – US south of Hopland, US 101 north of Hopland and SR 175 east of Old Hopland.

Stick Diagram Development

A stick diagram is schematic depiction of a traffic study network that illustrates roadways, intersections, traffic controls (e.g., signals, stop signs, etc.) turn movements (arrows) and other geometric data. The diagram also contains Average Daily Traffic (ADT) and turn movement volumes. Diagrams are not illustrated to scale. The primary purpose of these diagrams is to provide a graphic representation of the traffic distribution in a study network. Traffic volumes on the diagram may not balance from intersection to intersection because minor roadways, driveways, and intersections are not included on the diagram; however, traffic generated by these sources are accounted for in the process.

<u>Base Year Diagram</u> - A base year diagram is prepared to illustrate the existing study network and traffic volumes. Data collected from traffic counts are entered into the diagram. The Base Year Diagram provides the foundation for the No- Build and Build stick diagrams, models, microsimulation, and performance analysis.

<u>No-Build Diagrams</u> – The forecasted traffic data is applied to Base Year diagram with the assumption that a Bypass will not be built. Forecasted traffic volumes are distributed through the existing study network. Traffic flows in the network are adjusted and balanced through an iterative process of comparing relative turn movement percentages from the base year diagram. Diagrams are completed for the forecast years.

The term “No-Build” specifically refers to a scenario where a proposed project (in this case the Hopland Bypass) will not be built; however, this does not mean that other relatively minor improvements on the existing network would not be built. For planning purposes it assumed that minor improvements could be built to address capacity and safety concerns. Minor improvements would include addition of turn pockets, signalization of primary intersections, or other traffic controls. It is not assumed that major projects such as constructing additional lanes would be completed.

<u>Build Diagrams</u> – The traffic network of the No-Build diagram is modified to include a Bypass based on the proposed alternative alignments. Through iterative process forecasted traffic volumes are redistributed through the study network. Factors, such as those gleaned from the O/D Study are used to the estimate number of vehicles that would likely stay on the freeway. Diagrams of all the Bypass alternatives are completed for the forecast years. The distribution of traffic for each Bypass alternative changes based on the location of the interchanges and the number vehicles that are exiting and entering at those points.

Microsimulation and Performance Methodology

Traffic Software Integrated System

The Traffic Software Integrated System 5.0 (TSIS), developed by the Federal Highway Administration (FHWA), is the primary simulation software package used to model the Hopland Bypass project. TSIS 5.0 incorporates the CORSIM model, a stochastic microsimulation program that emulates vehicle behavior in a digital traffic network. CORSIM utilizes two subnetwork types: NETSIM- surface street system, and FRESIM – freeway system.

TSIS includes a graphic editor (TRAFED) that allows the import of a digital image, such as an aerial photograph, where the user “builds” a traffic network on top of the image. The model traffic network is constructed of a series of links and nodes. Links represent roadway segments and nodes represent intersections. The user defines link characteristics (e.g., number of lanes, average travel speed, etc) and node characteristics (e.g., traffic controls, turn movements, etc.). The user also enters traffic volumes and truck percentages at source (entry) nodes. The model uses the link/node characteristics, traffic volumes, and internal values such as vehicle type/performance, driver behavior, car following logic, start-up lost time, and a multitude of other attributes to simulate traffic flows in the digital network. When a simulation run is made the model applies these values to each simulated vehicle in the network on a second by second basis. The result is a digital replication of traffic flow during a predetermined time period.

TSIS also includes an animation module called TRAFVU. When a simulation run is completed TRAFVU displays an animated output of the network. The animation is played and traffic is visually displayed moving through the network.
The animation display is useful for calibrating and validating of the traffic simulation model.

A calibrated and validated Base Year model provides the foundation on which the No-Build and Build models are created. Calibration entails checking the model network inputs and characteristics for accuracy. The user checks and double-checks to make sure that the model inputs match the “real world” values. The validation process goes a step further and ensures the simulation results accurately represent traffic flow conditions based on field observations. Observed queue lengths, average speeds, and network congestion are the principal values used to validate a simulated network.

Microsimulation models using TSIS were created for Hopland Project Base Year 2001, No-Build and Build alternatives in 2021 and 2031. CORSIM provides for the use of random seed numbers that change vehicle entry headways which accounts for the variability of actual traffic conditions. Multiple CORSIM simulation runs were conducted for each Hopland Project scenario. Results were checked for validity and average values for delay and speed were extracted from the output files for comparison of measures of effectiveness.

Highway Capacity Manual and Highway Capacity Software

The Highway Capacity Manual 2000 (HCM2000), Transportation Research Board, National Research Council, Washington D.C., 2000, contains the most widely accepted methods for determining capacity and level of service (LOS) for surface transportation facilities. The HCM contains methodologies for common facility types such as freeways, ramps, highways, signalized intersections, etc. determining. The methodologies are deterministic mathematical models of vehicle behavior under various traffic flow and control situations. The HCM primarily addresses discrete facilities such as a single intersection or roadway segment. In most instances the HCM methodologies are not designed to address complex traffic flow relationships or highways with multiple passing lane segments. These situations are better analyzed with microsimulation.

The HCM Level of Service (LOS) standards are primarily based on capacity, performance, and driver perception. Capacity is generally expressed as the number passenger cars that can utilize a facility under given traffic volumes in a peak hour. Performance can be expressed a vehicle delay, average speed, or density. Ranges of capacity and performance values are given a LOS rating on an “A” to “F” scale, with “A” being the highest/best LOS and “F” the lowest/worst LOS conditions. Driver perception relates to how a driver is affected by those conditions. LOS was calculated for all the facility types in the Hopland Bypass study networks because the LOS standards contained in the HCM are the most widely accepted measures of performance.

The Highway Capacity Software (HCS) was developed to calculate capacity and level of service (LOS) using the HCM2000 methodologies. HCS was used for the Hopland Bypass project to augment the analysis done using microsimulation, and to calculate level of service for the facilities analyzed in the study. Tables II-1 through II-5 provide an overview the LOS criteria found in the HCM2000.

UCBRural/TWOPAS98

The Highway Capacity Manual (HCM) specifically states that the HCM methodology for two-lane highways does not accurately calculate the LOS for highways with multiple passing lane segments. The two-lane highway north of Hopland has multiple passing lane segments; consequently, another method of calculating Level of Service (LOS) was necessary.
UCBRural is graphical user interface developed by the University of California, Berkeley for the simulation modeling software TWOPAS98. The Federal Highway Administration developed TWOPAS98 to model two-lane highways with passing lanes and passing segments. TWOPAS 98 calculates average speed and Percent Time Spent Following (PTSF) which is the LOS criteria for two-lane highways. LOS is determined by comparing the calculated average speed and PTSF to the values included here in Table II-1.

UCBRural/TWOPAS98 was used to model the two-lane segments of US 101 north and south of downtown Hopland in the Base Year and No-Build scenarios. UCBRural/TWOPAS98 is also a stochastic model that allows random seed numbers to be entered for multiple runs. Average values for PTSF from multiple UCBRural/TWOPAS98 runs were used in conjunction with average speeds from CORSIM modeling determine the two-lane LOS.

Table II-1. Freeway LOS Criteria

LOS	Description
A	Describes free-flow operations. Free-flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. Density = 0 to 11 passenger cars per lane per mile (pcplpm)
B	Represents reasonable free-flow and free-flow speeds are maintained. The ability to maneuver is only slightly restricted. Density = 11.1 to 18 pcplpm
C	Provides for flows with speeds still at near the free-flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted and lane changes require more vigilance. Density = 18.1 to 26 pcplpm
D	At this level speeds begin to decline slightly with increased flows. In this range, density begins to deteriorate somewhat more quickly with increased flows. Density = 26.1 to 35 pcplpm
E	Upper range describes operation at capacity. Operations at this level are volatile, because there are virtually no usable gaps in the traffic stream leaving little room to maneuver. Density = 35.1 to 45 pcplpm
F	Describes breakdown in vehicular flow. Such conditions generally exist within queues forming behind breakdown points. Density = >45 pcplpm

Table II-2. Two-Lane Highway LOS Criteria (Class I Facility)

LOS	Description	
	Average Speed	**Percent Time Spent Following**
A	>55 mph	≤35%
B	>50-55 mph	>35-50%
C	>45-50 mph	>50-65%
D	>40-45 mph	>65-80%
E	≤40 mph	>80%
F	Facility exceeds capacity	

Note: LOS for two-lane highway is the lower of the calculated values

Table II-3. Freeway Merge/Diverge (Ramp) LOS Criteria

LOS	Description
A	≤10 passenger cars per lane per hour (pcplph)
B	10.1 to 20 pcplph
C	20.1 to 28 pcplph
D	28.1 to 35 pcplph
E	>35 pcplph
F	Facility exceeds capacity

Table II-4. Two-Way and All-Way Stop Controlled Intersection LOS Criteria

LOS	Description
A	Average Control Delay ≤ 10 seconds per vehicle
B	Average Control Delay >10 and ≤ 15 seconds per vehicle
C	Average Control Delay >15 and ≤ 25 seconds per vehicle
D	Average Control Delay >25 and ≤ 35 seconds per vehicle
E	Average Control Delay >35 and ≤ 50 seconds per vehicle
F	Average Control Delay >50 seconds per vehicle

Table II-5. Signalized Intersections LOS Criteria

LOS	Description
A	Very low delay, up to 10 seconds per vehicle.
B	Delay >10 and up to 20 sec per vehicle. Generally good progression.
C	Delay > 20 and up to 35 sec per vehicle. The number of vehicles stopping is significant at this level. Fair progression.
D	Delay > 35 and up to 55 sec per vehicle. Many vehicles stop. Proportion of non-stoppers decline. Noticeable congestion.
E	Delay > 55 and up to 80 sec per vehicle. This level is considered to be the limit of acceptable delay.
F	Delay in excess of 80 sec per vehicle. This level is considered unacceptable to most drivers. Over saturation. Force flow. Extensive queuing.

SIGCinema

SIGCinema, developed by KLD Associates, is a stand-alone software package that incorporates the Highway Capacity Manual methodology for signalized intersections. SIGCinema also has simulation and animation capabilities. SIGCinema was utilized to analyze the signalized intersections included in the Hopland Bypass 2021 and 2031 No-Build scenario, and 2031 North Hopland Expressway alternative. The software was used to developed signal timing plans and to calculate LOS.

III. FORECASTING, MODELING, AND PERFORMANCE ANALYSIS

The following discussions provide an overview of the results of the forecasting, modeling, and analysis completed for each scenario in the study. Figures III-1 through III-13 contain the stick diagrams for each scenario. The stick diagrams include the calculated HCM level of service (LOS) for each facility type, turn movement volumes, Average Annual Daily Traffic (AADT) and a brief summary of the modeling results.

Base Year - 2001 – Existing Conditions (FIGURE III-1)

The Base Year 2001 CORSIM model was created based on the existing traffic network with PM Peak Hour traffic and turn movement volumes derived from traffic counts conducted in May/July 2000 and October 2001. The CORSIM model was calibrated and validated to observed existing conditions. CORSIM allows the modeling of parking behavior and pedestrian activity on a local street network. The Base Year CORSIM model was programmed with parking zones in downtown Hopland and pedestrian crossings. Parking and pedestrian activity were coded to replicate observed movements in the Base Year.

Field observations indicated substantial delay and queuing at several stop-controlled intersections. The westbound SR 175 left-turn lane at US 101 can experience peak hour queues of 10 vehicles or more. Fast moving vehicles and platoons of vehicles on US 101 impede traffic from the intersecting roadways. Vehicles at times have to wait several minutes to complete left turns across US 101. CORSIM modeling replicated the delay and queuing observed in the field.

Table III-1. Base Year - 2001 - US 101 - Level of Service (LOS)

US 101 - Mainline		Post Mile		*Avg. Speed	**PTSF	LOS
		Begin	End			
South of Hopland	NB	8.8	10.6	48 mph	71%	D
	SB			48 mph	63%	C
Downtown Hopland	NB	10.6	11.5	36 mph	-	***E
	SB			37 mph	-	***E
North Hopland	NB	11.5	17.6	49 mph	66%	D
	SB			53 mph	51%	C

* Speeds derived from CORSIM model/simulation results
** PTSF – Percent Time Spent Following values derived from UCBRural/TWOPAS98 modeling
*** Speed limit is below HCM LOS E standards for Class I two-lane highway.

CORSIM modeling results indicate that overall delay in the network, which includes all roadways, is 58.33 hours or .24 minutes (14 seconds) for each vehicle mile traveled during the peak hour. Average travel time on US 101 between Eastside Road in the south and Henry Station Road in the north was approximately 9.7 minutes northbound and 9.2 minutes southbound.

Table III-1 shows the average speeds on US 101 as derived form the CORSIM model. Speeds are consistent with speeds obtained from tachogrpahic runs completed for the project. Percent Time Spent Following (PTSF) was obtained from UCBRural modeling, and Level of Service (LOS) was determined from HCM2000 LOS standards for Class 1 - two-lane highways.

Table III-2. Base Year - 2001 – Intersection - Level of Service (LOS)

Intersections		LOS By Approach/Lane(s) Group											
		Northbound			Southbound			Westbound			Eastbound		
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.
US 101	Eastside Road				A			F					
US 101	Mountain House Rd.	A										F	
US 101	SR 175 (Hopland Rd.)				A			F		C			
US 101	Henry Station Rd.				A				C			E	
SR 175 (Hopland Rd.)	Eastside Rd. - South	B		B				A					
SR 175 (Hopland Rd.)	Eastside Road - North	A			B								

Note: All intersections are two-way stop controlled. LOS was calculated using the HCM 2000 methodology

No-Build Alternatives

The No-Build alternatives assume no Bypass will be built. The purpose of the No-Build alternatives is predict and estimate how the existing traffic network would operate under increased traffic conditions in future years without substantial improvements (e.g., additional lanes).

No-Build - 2021 (FIGURE III-2)

The 2021 No-Build CORSIM model was created using the Base Year Model as a template. The traffic volumes were increased according to the forecast. Preliminary model simulation runs showed significant delays and queues occurring in the network. The intersection approaches to US 101 at Mountain House and SR 175 had a substantial number vehicles that could not make left turns onto US 101 which created unmet travel demand in the network. It was determined that for planning purposes that these two intersections would be signalized in the future because vehicles attempting to access US 101 would be unable to do so without signalization. Other minor improvements were also incorporated into the No Build model such as a left turn pocket on US 101 at Eastside Road and a right turn pocket on the Mountain House approach to US 101.

CORSIM modeling results showed that even with the minor improvements overall system delay increases to 128.3 hours or .36 minutes (22 seconds) per vehicle mile traveled. Average travel time on US 101 between Eastside Road in the south and Henry Station Road in the north increases to approximately 10.2 minutes northbound and 9.75 minutes southbound. Platooning and queuing is commonplace in the simulation. Percent Time Spent Following on US 101 increases, average speed decreases, and LOS declines.

Table III-3. No-Build – 2021 – US 101 - Level of Service (LOS)

US 101 - Mainline		Post Mile		Avg. Speed	*PTSF	LOS
		Begin	End			
South of Hopland	NB	8.8	10.6	47 mph	86%	E
	SB			47 mph	79%	D
Downtown Hopland	NB	10.6	11.5	31 mph	-	*E
	SB			33 mph	-	*E
North Hopland	NB	11.5	17.6	47 mph	82%	E
	SB			50 mph	71%	D

* PTSF – Percent Time Spent Following values derived from UCBRural/TWOPAS98 modeling

* Speed limit is below HCM LOS E standards for Class I two-lane highway.

Table III-4. No-Build - 2021 – Intersection - Level of Service (LOS)

Intersections		LOS By Approach/Lane(s) Group												Overall LOS
		Northbound			Southbound			Westbound			Eastbound			
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	
US 101	Eastside Road				B			F						N/A
*US 101	*Mountain House Rd.	C				B					D			C
*US 101	*SR 175 (Hopland Rd.)		E		B			E		E				D
US 101	Henry Station Rd.	B			B			F			F			N/A
SR 175 (Hopland Rd.)	Eastside Rd. - South	B		B				A						N/A
SR 175 (Hopland Rd.)	Eastside Road - North	A			B									N/A

*Signalized Intersections – LOS calculated using SIGCinema. All other intersections are stop-controlled intersections, and LOS was calculated using the HCM 2000 methodology

As indicated in Table III-4, only two intersections had LOS “F” approaches – westbound Eastside Road at US 101, and the westbound/eastbound approaches to US 101 at Henry Station Road. Although these approaches were LOS “F”, and vehicles attempting to access US 101 had considerable delay, there was no unmet demand. All vehicles were able to enter US 101 during the peak hour.

2031 – No-Build (FIGURE III-3)

The 2031 No-Build CORSIM model was created using the 2021 No-build model as a template. The traffic volumes were increased according to the forecast. The minor roadway and signalization improvements from the 2021 No-Build scenario were maintained, but no other improvements were included.

Table III-5. No-Build – 2031 – US 101 - Level of Service (LOS)

US 101 - Mainline		Post Mile Begin	Post Mile End	Avg. Speed	*PTSF	LOS
South of Hopland	NB	8.8	10.6	46 mph	94%	E
	SB			46 mph	87%	E
Downtown Hopland	NB	10.6	11.5	29 mph	-	*E
	SB			32 mph	-	*E
North Hopland	NB	11.5	17.6	43 mph	87%	E
	SB			50 mph	78%	D

* PTSF – Percent Time Spent Following values derived from UCBRural/TWOPAS98 modeling

- Speed limit is below HCM LOS E standards for Class I two-lane highway.

Average overall system delay in the 2031 No-Build scenario increased to 254.28 hours or .49 minutes (30 seconds) per vehicle mile traveled. Average travel time on US 101 between Eastside Road in the south and Henry Station Road in the north increases to approximately 11.0 minutes northbound and 9.85 minutes southbound. Long platoons of vehicles are the norm in the simulation and long queues build at the signalized intersection approaches. All segments of US 101 decline to LOS “E”, except for southbound US 101 north of Hopland which is LOS “D”.

Table III-6. No-Build - 2031 – Intersection - Level of Service (LOS)

Intersections		LOS By Approach/Lane(s) Group												Overall LOS
		Northbound			Southbound			Westbound			Eastbound			
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	
US 101	Eastside Road				B			F						N/A
*US 101	*Mountain House Rd.	E				D					E			E
*US 101	*SR 175 (Hopland Rd.)		F		D			F		F				F
US 101	Henry Station Rd.	B			C			F			F			N/A
SR 175 (Hopland Rd.)	Eastside Rd. - South	C		C				A						N/A
SR 175 (Hopland Rd.)	Eastside Road - North	A			C									N/A

*Signalized Intersections – LOS calculated using SIGCinema. All other intersections are stop-controlled intersections, and LOS was calculated using the HCM 2000 methodology

As illustrated in Table III-6, LOS at the signalized intersections declines to unacceptable levels. The minor approaches to US 101 at Eastside Road and Henry Station Road are still LOS “F” with delays increasing substantially for vehicles attempting left turns.

Build Alternatives

The Build alternatives include the proposed alignments for the Hopland Bypass and the North Hopland project. All Bypass alignments are 4-lane freeway with a 65-mph free flow speed. All interchanges are tight diamond configuration. For modeling purposes, each of the Hopland Bypass alternatives was combined with the North Hopland Freeway (NHF) alternative. The North Hopland Freeway 1 (NHF1), North Hopland Freeway 2 (NHF2), and the Expressway (NHE) were analyzed separately. Also Hopland Bypass alternatives Valley West #2 (VW2) and Valley East #2 (VE2) were incorporated into a single model and forecast. There was only a minor difference between VW2 and VE2 alignments, and both alignments contained the same interchange configurations and locations.

The CORSIM Build models have two sub-networks – surface streets (NETSIM) and the Bypass freeway (FRESIM). CORSIM provides overall network statistics and statistics for the sub-networks. The No-Build models only had a surface street network.

Valley East2/Valley West2 (VE2/VW2) Alternative - 2021 (FIGURE III-4)

The VE2/VW2 alternative includes three interchanges – South IC, Sundial IC and McNab IC. There is no interchange at SR 175. Southbound US 101 traffic would use the Sundial IC to access SR 175 and northbound US 101 traffic would us the South IC. The Base Year traffic counts indicated that Eastside Road was being used as a “shortcut” between US 101 and SR 175. This is likely to continue in the future. These factors were important for estimating the distribution of traffic to the local street network in the future.

The 2021 VE2/VW2 CORSIM model was created using the Base Year Model as a template. The VE2/VW2 Bypass alignment and interchanges were added to the model and traffic volumes were increased and distributed to local street system and Bypass according to the forecast.

Overall delay in the system was 36.14 hours or 0.07 minutes (4.2 seconds) per vehicle mile traveled. Local network delay was 25.60 hours or 0.30 minutes (18 seconds) per vehicle mile traveled, and freeway (Bypass) delay was 10.54 hours or 0.03 minutes (1.8 seconds) per vehicle mile traveled.

Table III-7. VW2/VE2 - 2021 - Ramp Intersections - LOS

VW2 and VE2 Interchanges Offramp/Onramp Intersections	LOS By Approach/Lane(s) Group											
	Northbound			Southbound			Westbound			Eastbound		
	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.
South IC Northbound	B									A		
South IC Southbound						B	A					
Sundial IC Northbound	B									A		
Sundial IC Southbound						B	A					
McNab IC Northbound	A		A							A		
McNab IC Southbound				A		A	A					

All intersections are two-way stop controlled. LOS calculated using HCS2000

Average travel time on the Bypass from Eastside Road to the McNab IC is approximately 7.11 minutes. Average speed on the Bypass (all vehicles including trucks) was 63.13 miles per hour. The Bypass is calculated to maintain LOS "A" or "B" for all freeway segments and merging/diverging (onramp/offramp) areas. As indicated by Table III-7 below, all interchange ramp intersections are at LOS "A" or "B".

Table III-8 shows the level of service for the surface street system intersections. The table includes the two new intersections at the access roads to the South IC and the Sundial IC. All the intersections are two-way stop controlled except for the new Sundial access intersection. This intersection had unacceptable LOS when analyzed as a two-way stop controlled intersection. LOS improved substantially when the intersection was coded as an all-way stop intersection and analyzed with HCS2000.

Table III-8. VW2/VE2 - 2021 – Local Street Intersections - LOS

Intersections		LOS By Approach/Lane(s) Group											
		Northbound			Southbound			Westbound			Eastbound		
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.
Old US 101	Eastside Road				A			B					
Old US 101	Mountain House Rd.	A									B		B
Old US 101	SR 175 (Hopland Rd.)				A			C		B			
Old US 101	Henry Station Rd.	A			A				B			B	
SR 175 (Hopland Rd.)	Eastside Rd. - South	C		C				A					
SR 175 (Hopland Rd.)	Eastside Road - North	A			C					B			
Old US 101	South IC Access				A								
*Old US 101	*Sundial IC Access	B	B	B	B	A	A	B	A	A		A	

*All-way stop controlled intersection – all others are two-way stop controlled. LOS calculated using HCS2000

Valley East2/Valley West2 (VE2/VW2) Alternative - 2031 (FIGURE III-5)

The 2031 VE2/VW2 CORSIM model was created using the 2031 VE2/VW2 as a template. Simulation results showed that overall delay in the system increased by about 16 hours to 50.79 hours or 0.09 minutes (5.4 seconds) per vehicle mile traveled. Local network delay was 34.74 hours or 0.33 minutes (19.8 seconds) per vehicle mile traveled, and freeway (Bypass) delay was 16.05 hours or 0.031 minutes (1.86 seconds) per vehicle mile traveled.

Table III-9. VW2/VE2 - 2031 - Ramp Intersections - LOS

VW2 and VE2 Interchanges Offramp/Onramp Intersections	LOS By Approach/Lane(s) Group											
	Northbound			Southbound			Westbound			Eastbound		
	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.
South IC Northbound	B									A		
South IC Southbound						C	A					
Sundial IC Northbound	C									A		
Sundial IC Southbound						B	A					
McNab IC Northbound	A		A							A		
McNab IC Southbound				B		B	A					

All intersections are two-way stop controlled. LOS calculated using HCS2000

Table III-10. VW2/VE2 - 2031 – Local Street Intersections - LOS

Intersections		LOS By Approach/Lane(s) Group											
		Northbound			Southbound			Westbound			Eastbound		
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.
Old US 101	Eastside Road				A			B					
Old US 101	Mountain House Rd.	A									C		C
Old US 101	SR 175 (Hopland Rd.)				A			C		B			
Old US 101	Henry Station Rd.	A			A			B			B		
SR 175 (Hopland Rd.)	Eastside Rd. - South	C		C				A					
SR 175 (Hopland Rd.)	Eastside Road - North	A			C								
Old US 101	South IC Access				A								
*Old US 101	*Sundial IC Access	B	B	B	B	A	A	B	A	A	A		

*All-way stop controlled intersection – all others are two-way stop controlled. LOS calculated using HCS2000

Average travel time on the Bypass from Eastside Road to the McNab IC is approximately 7.12 minutes. Average speed on the Bypass (all vehicles including trucks) was 62.67 miles per hour. The Bypass is calculated to maintain at least a LOS “B” for all freeway segments and merging/diverging (onramp/offramp) areas. As indicated by Table III-9, all interchange ramp intersections are LOS “C” or better.

Table III-10 above, shows the level of service for the surface street system. No changes were made to intersection configurations or geometry between the 2021 scenario and the 2031 scenario. All intersections are projected to operate at an acceptable LOS.

Valley West 3 (VW3) Alternative - 2021 (FIGURE III-6)

The VW3 alternative includes three interchanges (IC) – Feliz IC, Sundial IC and McNab IC. There is no interchange at SR 175. Northbound US 101 includes an at-grade, right-in/right-out only intersection at Eastside Road. As indicated by the Base Year traffic counts, Eastside Road is being used as a “shortcut” between US 101 and SR 175. The proposed right-in/right-out intersection will ensure that this will continue in the future; however, westbound SR 175 traffic will not be able to access southbound US 101 from Eastside Road. The Feliz IC, via old US 101, will provide access for SR 175 traffic to southbound US 101. These features of the VW3 alternative had the greatest affect on the future distribution of traffic.

The 2021 VW3 CORSIM model was created using the Base Year Model as a template. The VW3 Bypass alignment and interchanges were added to the model and traffic volumes were increased and distributed to local street system and Bypass according to the forecast.

Overall delay in the system was calculated by CORSIM to be 33.70 hours or 0.07 minutes (4.2 seconds) per vehicle mile traveled. Local network delay was 22.74 hours or 0.30 minutes (18 seconds) per vehicle mile traveled, and freeway (Bypass) delay was 10.96 hours or 0.03 minutes (1.8 seconds) per vehicle mile traveled.

Average travel time on the Bypass from Eastside Road to the McNab IC is approximately 7.19 minutes. Average speed on the Bypass (all vehicles including trucks) was 63.10 miles per hour. The Bypass is calculated to maintain LOS “A” or “B” for all freeway segments and merging/diverging (onramp/offramp) areas. As indicated by Table III-11 below, all ramp intersections are at LOS “A” or “B”.

Table III-12 illustrates the level of service for the surface street system intersections. The table includes the two new intersections at the access roads to the Feliz IC and the Sundial IC. All intersections are two-way stop controlled except for the Old US 101/SR 175 (Hopland Road) intersection. This intersection had unacceptable LOS when analyzed using the HCM methodology for two-way stop controlled intersections. LOS improved substantially when the intersection was coded as an all-way stop intersection and analyzed with HCS2000. It is important to note that in the CORSIM simulation, observed queues at this intersection were less than 4 cars on average and there was no unmet demand even when it was coded as a two-way stop controlled intersection.

Table III-11. VW3 - 2021 - Ramp Intersection - LOS

VW2 and VE2 Interchanges Offramp/Onramp Intersections	LOS By Approach/Lane(s) Group											
	Northbound			Southbound			Westbound			Eastbound		
	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.
Feliz IC Northbound	B									A		
Feliz IC Southbound						A	A					
Sundial IC Northbound	B									A		
Sundial IC Southbound						B	A					
McNab IC Northbound	A		A							A		
McNab IC Southbound				A		A	A					

All intersections are two-way stop controlled. LOS calculated using HCS2000

Table III-12. VW3 - 2021 – Local Street Intersections - LOS

Intersections		LOS By Approach/Lane(s) Group											
		Northbound			Southbound			Westbound			Eastbound		
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.
Old US 101	Eastside Road									B			
Old US 101	Mountain House Rd.	A									C		C
*Old US 101	*SR 175 (Hopland Rd.)		B	A	B		B	B		B			
Old US 101	Henry Station Rd.	A			A				B			B	
SR 175 (Hopland Rd.)	Eastside Rd. - South	B		B				A					
SR 175 (Hopland Rd.)	Eastside Road - North	A			C								
Old US 101	Feliz IC Access				A			B		B			
Old US 101	Sundial IC Access	A			A			B	A			B	

*All-way stop controlled intersection – all others are two-way stop controlled. LOS calculated using HCS2000

Valley West 3 (VW3) Alternative - 2031 (FIGURE III-7)

The 2031 VW3 CORSIM model was created using the 2021 VW3 as a template. Simulation results showed that in 2031 overall delay in the system increased by about 13 hours to 46.67

hours or 0.08 minutes (4.8 seconds) per vehicle mile traveled. Local network delay was 30.55 hours or 0.34 minutes (20.4 seconds) per vehicle mile traveled, and freeway (Bypass) delay was 16.12 hours or 0.030 minutes (1.8 seconds) per vehicle mile traveled.

Table III-13. VW3 - 2031 - Ramp Intersection - LOS

VW2 and VE2 Interchanges Offramp/Onramp Intersections	LOS By Approach/Lane(s) Group											
	Northbound			Southbound			Westbound			Eastbound		
	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.
Feliz IC Northbound	B									A		
Feliz IC Southbound						B	A					
Sundial IC Northbound	C									A		
Sundial IC Southbound						B	A					
McNab IC Northbound	A		A							A		
McNab IC Southbound				B		B	A					

All intersections are two-way stop controlled. LOS calculated using HCS2000

Average travel time on the Bypass from Eastside Road to the McNab IC is approximately 7.24 minutes. Average speed on the Bypass (all vehicles including trucks) was 62.68 miles per hour. The Bypass is calculated to maintain at least a LOS "B" for all freeway segments and merging/diverging (onramp/offramp) areas. As indicated by Table III-13 below, most interchange ramp intersections are LOS "A" or "B".

Table III-14 below, shows the level of service for the surface street system. No changes were made to intersection configurations or geometry between the 2021 scenario and the 2031 scenario. All intersections are projected to operate at an acceptable LOS, except for the eastbound approach at Mountain House and Old US 101. This approach has LOS "E". HCS analysis indicates delay will be less than 50 seconds. In the CORSIM simulation observed queuing was less than 3 vehicles. This intersection should operate better than the HCM analysis indicates.

Table III-14. VW3 - 2031– Local Street Intersections - LOS

Intersections		LOS By Approach/Lane(s) Group											
		Northbound			Southbound			Westbound			Eastbound		
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.
Old US 101	Eastside Road									B			
Old US 101	Mountain House Rd.	A									E		E
*Old US 101	*SR 175 (Hopland Rd.)		C	A	C		B	C		B			
Old US 101	Henry Station Rd.	A			A				B			B	
SR 175 (Hopland Rd.)	Eastside Rd. - South	C		C				A					
SR 175 (Hopland Rd.)	Eastside Road - North	A			C								
Old US 101	Feliz IC Access				A			B		B			
Old US 101	Sundial IC Access	A			A			D	B			B	

*All-way stop controlled intersection – all others are two-way stop controlled. LOS calculated using HCS2000

Valley East 3 (VE3) Alternative - 2021 (FIGURE III-8)

The VW3 alternative includes three interchanges (IC) – Valley 175 IC, Sundial IC and McNab IC. There is no South IC in this alternative. The Valley 175 IC had the most influence on the distribution of forecasted traffic volumes. More traffic will utilize this interchange because of its location.

The 2021 VE3 CORSIM model was created using the Base Year Model as a template. The VW3 Bypass alignment and interchanges were added to the model and traffic volumes were increased and distributed to local street system and Bypass according to the forecast.

Overall delay in the system was calculated by CORSIM to be 40.24 hours or 0.07 minutes (4.2 seconds) per vehicle mile traveled. Vehicle miles traveled (VMT) in this model were higher than in other alternatives because the Valley 175 IC location facilitated the use of the Bypass for local trips. Local network delay was 23.57 hours or 0.31 minutes (18.6 seconds) per vehicle mile traveled, and freeway (Bypass) delay was 16.67 hours or 0.034 minutes (2.04 seconds) per vehicle mile traveled. Freeway delay was also higher in this scenario due to local traffic on the Bypass.

Average travel time on the Bypass from Eastside Road to the McNab IC is approximately 7.01 minutes. Average speed on the Bypass (all vehicles including trucks) was 62.65 miles per hour. The Bypass is calculated to maintain LOS "A" or "B" for all freeway segments and merging/diverging (onramp/offramp) areas.

Table III-15. VE3 - 2021 - Ramp Intersection - LOS

VW2 and VE2 Interchanges Offramp/Onramp Intersections	LOS By Approach/Lane(s) Group											
	Northbound			Southbound			Westbound			Eastbound		
	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.
*Valley 175 IC Northbound	B		B					C	B	B	A	
*Valley 175 IC Southbound				B		A	B		B		B	B
Sundial IC Northbound	B									A		
Sundial IC Southbound						A	A					
McNab IC Northbound	A		A							A		
McNab IC Southbound				A		A	A					

*All-way stop controlled intersection – all others are two-way stop controlled. LOS calculated using HCS2000

The Valley 175 offramp/onramp intersections were coded in the CORSIM model as two-way stop controlled. Simulation results showed that some moderate queuing occurred at these intersections. HCS analysis indicated that these offramp approaches would operate at LOS "F". The intersections were reanalyzed as all-way stop-controlled and LOS improved to "A" or "B". As indicated by Table III-15 above, all ramp intersections are projected to operate at LOS "B" or better.

Table III-16 below, shows the level of service for the surface street system intersections. The table includes one new intersection at the new access road to the Sundial IC. All intersections are two-way stop controlled. The left-turn lane on SR 175 at Old US 101 is LOS "D", but combined LOS for this approach is "C".

Table III-16. VE3 – 2021 – Local Street Intersections - LOS

Intersections		LOS By Approach/Lane(s) Group											
		Northbound			Southbound			Westbound			Eastbound		
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.
Old US 101	Mountain House Rd.	A									B		B
Old US 101	SR 175 (Hopland Rd.)				A			D		B			
Old US 101	Henry Station Rd.	A			A				B			A	
SR 175 (Hopland Rd.)	Eastside Rd. - South	B		B				A					
SR 175 (Hopland Rd.)	Eastside Road - North	A			B								
Old US 101	Sundial IC Access	A			A			C	A			B	

All intersections are two-way stop controlled. LOS calculated using HCS2000

Valley East 3 (VE3) Alternative - 2031 (FIGURE III-9)

The 2031 VE3 CORSIM model was created using the 2021 VE3 as a template. Simulation results showed that in 2031 overall delay in the system increased by about 13 hours to 46.34 hours or 0.08 minutes (4.8 seconds) per vehicle mile traveled. Local network delay was 25.61 hours or 0.30 minutes (18 seconds) per vehicle mile traveled, and freeway (Bypass) delay was 19.15 hours or 0.040 minutes (2.4 seconds) per vehicle mile traveled.

Average travel time on the Bypass from Eastside Road to the McNab IC is approximately 7.06 minutes. Average speed on the Bypass (all vehicles including trucks) was 62.48 miles per hour. All freeway segments and merging/diverging (onramp/offramp) areas are LOS “B”.

As indicated by Table III-17 below, most interchange ramp intersections are LOS “A” or “B”. The westbound SR 175 through lane at the northbound Valley 175 offramp intersection is LOS “D”, but the approach is LOS “C”.

Table III-17. VE3 - 2031 - Ramp Intersection - LOS

VW2 and VE2 Interchanges Offramp/Onramp Intersections	LOS By Approach/Lane(s) Group											
	Northbound			Southbound			Westbound			Eastbound		
	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.
*Valley 175 IC Northbound	C		B					D	B	B	A	
*Valley 175 IC Southbound				B		B	C	B			A	B
Sundial IC Northbound	B									A		
Sundial IC Southbound						B	A					
McNab IC Northbound	A		A							A		
McNab IC Southbound				B		B	A					

*All-way stop controlled intersection – all others are two-way stop controlled. LOS calculated using HCS2000

The level of service for the surface street system is shown in Table III-18 below. No changes were made to intersection configurations or geometry between the 2021 scenario and the 2031 scenario. Most intersections movements are projected to operate at an acceptable LOS, except for the westbound left-turn at SR 175 (Hopland Road) and Old US 101. This movement has a LOS “F”; however the westbound approach (right and left turn lanes combined) is LOS “D”. This is an acceptable LOS.

Table III-18. VE3 - 2031 – Local Street Intersections - LOS

Intersections		LOS By Approach/Lane(s) Group											
		Northbound			Southbound			Westbound			Eastbound		
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.
Old US 101	Mountain House Rd.	A									C		C
Old US 101	SR 175 (Hopland Rd.)				A			F		B			
Old US 101	Henry Station Rd.	A			A			B			B		
SR 175 (Hopland Rd.)	Eastside Rd. - South	B		B				A					
SR 175 (Hopland Rd.)	Eastside Road - North	A			C								
Old US 101	Sundial IC Access	A			A			C	B		B		

All intersections are two-way stop controlled. LOS calculated using HCS2000

East Freeway (E-1) Alternative - 2021 (FIGURE III-10)

The E-1 alternative includes four interchanges (IC) – South IC, East 175 IC, CDF IC and McNab IC. The four interchanges provide a more even distribution of local trips. The East 175 IC specifically reduces the numbers of local trips between Hopland and Old Hopland and on Old US 101.

The 2021 E-1 CORSIM model was created using the Base Year Model as a template. The E-1 Bypass alignment and interchanges were added to the model and traffic volumes were increased and distributed to local street system and Bypass according to the forecast.

Overall delay in the system was calculated by CORSIM to be 36.96 hours or 0.07 minutes (4.2 seconds) per vehicle mile traveled. Local network delay was 23.83 hours or 0.31 minutes (18.6 seconds) per vehicle mile traveled, and freeway (Bypass) delay was 13.22 hours or 0.03 minutes (1.8 seconds) per vehicle mile traveled.

Average travel time on the Bypass from Eastside Road to the McNab IC is approximately 7.58 minutes. Average speed on the Bypass (all vehicles including trucks) was 62.85 miles per hour. The Bypass is calculated to maintain LOS "A" or "B" for all freeway segments and merging/diverging (onramp/offramp) areas.

All ramp intersections were coded in the CORSIM model as two-way stop controlled. As indicated by Table III-19, most ramp intersection movements are projected to operate at LOS "A". Some left-turn movements are LOS "C". All are within acceptable range.

Table III-19. E-1 - 2021 - Ramp Intersection - LOS

VW2 and VE2 Interchanges Offramp/Onramp Intersections	LOS By Approach/Lane(s) Group											
	Northbound			Southbound			Westbound			Eastbound		
	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.
South IC Northbound	B									A		
South IC Southbound						A	A					
East 175 IC Northbound	C		B							A		
East 175 IC Southbound				C		A	A					
CDF IC Northbound	B									A		
CDF IC Southbound						A	A					
McNab IC Northbound	A		A							A		
McNab IC Southbound				A		A	A					

*All-way stop controlled intersection – all others are two-way stop controlled. LOS calculated using HCS2000

Table III-20. E-1 - 2021 – Local Street Intersections - LOS

Intersections		LOS By Approach/Lane(s) Group											
		Northbound			Southbound			Westbound			Eastbound		
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.
Old US 101	Eastside Road				A			B		B			
Old US 101	Mountain House Rd.	A									C		C
Old US 101	SR 175 (Hopland Rd.)				A			C		B			
Old US 101	Henry Station Rd.	A			A				B			A	
SR 175 (Hopland Rd.)	Eastside Rd. - South	B		B				A					
SR 175 (Hopland Rd.)	Eastside Road - North	A		A	B		B						
Old US 101	CDF IC Access	A			A			C		A		B	

All intersections are two-way stop controlled. LOS calculated using HCS2000

Table III-20 shows the level of service for the surface street system intersections. The table includes one new intersection at the new access road to the CDF IC. The South IC access/US 101 intersection was not included because there are no conflicting traffic movements. All intersections are two-way stop controlled. All intersections are anticipated to operate within acceptable limits.

East Freeway (E-1) Alternative - 2031 (FIGURE III-11)

The 2031 E-1 CORSIM model was created using the 2021 E-1 as a template. Simulation results showed that in 2031 overall delay in the system increased by about 10 hours to 46.46 hours or 0.08 minutes (4.8 seconds) per vehicle mile traveled. Local network delay was 27.23 hours or 0.31 minutes (18.6 seconds) per vehicle mile traveled, and freeway (Bypass) delay was 19.28 hours or 0.040 minutes (2.4 seconds) per vehicle mile traveled.

Average travel time on the Bypass from Eastside Road to the McNab IC is approximately 7.63 minutes. Average speed on the Bypass (all vehicles including trucks) was 62.43 miles per hour. All freeway segments and merging/diverging (onramp/offramp) areas are LOS “B”.

As indicated by Table III-21 below, interchange ramp intersections remain at an acceptable LOS in 2031.

Table III-21. E-1 - 2031 - Ramp Intersection - LOS

VW2 and VE2 Interchanges Offramp/Onramp Intersections	LOS By Approach/Lane(s) Group											
	Northbound			Southbound			Westbound			Eastbound		
	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.	Lt.	Th	Rt.
South IC Northbound	B									A		
South IC Southbound						A	A					
East 175 IC Northbound	C		B							A		
East 175 IC Southbound				C		A	A					
CDF IC Northbound	C									A		
CDF IC Southbound						B	A					
McNab IC Northbound	A		A							A		
McNab IC Southbound				B		B	A					

*All-way stop controlled intersection – all others are two-way stop controlled. LOS calculated using HCS2000

The level of service for the surface street system is shown in Table III-22 below. No changes were made to intersection configurations or geometry between the 2021 scenario and the 2031 scenario. All intersection movements are projected to operate at an acceptable LOS.

Table III-22. E-1 - 2031 – Local Street Intersections - LOS

Intersections		LOS By Approach/Lane(s) Group											
		Northbound			Southbound			Westbound			Eastbound		
Major Approach	Minor Approach	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.	Lt.	Th.	Rt.
Old US 101	Eastside Road				A			B		B			
Old US 101	Mountain House Rd.	A									D		D
Old US 101	SR 175 (Hopland Rd.)				A			D		B			
Old US 101	Henry Station Rd.	A			A				B			B	
SR 175 (Hopland Rd.)	Eastside Rd. - South	B		B				A					
SR 175 (Hopland Rd.)	Eastside Road - North	A		A	C		C						
Old US 101	CDF IC Access	A			A			C		B		B	

All intersections are two-way stop controlled. LOS calculated using HCS2000

North Hopland Freeway Alternatives (NHF/NHF1/NHF2)

As indicated previously the North Hopland Freeway (NHF) alternative was combined and analyzed with each of the Hopland Bypass alternatives. The statistics and performance results for the Bypass alternatives include the NHF.

The NHF1 alternative reroutes a portion of Old US 101 near the northern end of the alignment at the McNab IC. The NHF2 alternative eliminates a portion of Old US 101 as a frontage road. Only minor adjustments in traffic volumes result from these design changes (See Figures III-12, III-13, III-14, and III-15). The minor changes in the distribution of traffic from alternatives NHF1 and NHF2 will have no significant affect on the performance of the freeway. The results obtained from modeling the NHF with each of the Hopland Bypass alternatives is considered valid for the NHF1 and NHF2 alternatives.

North Hopland Expressway (NHE) 2021/2031 – FIGURES III-16 & III-17

The NHE alternative is a four-lane expressway with several at-grade intersections. For modeling purposes the NHE alternative was combined with the VE2/VW2 Hopland Bypass alternative. All intersections in the 2021 NHE alternative model were coded as two-way stop controlled and simulation runs were made. The results of the NHE 2021 model simulation showed no unmet demand (unreleased vehicles) in the network, but left-turns and traffic trying to cross US 101 had long delays and were at LOS “F” when analyzed in HCS.

The NHE 2031 model simulation runs showed through traffic and left-turns from Henry Station Road were unable to get across US 101 because of platoons with very few gaps in the traffic stream. There were vehicles stacked-up in queues that were never able to enter or cross US 101. Because of this it was determined that the Henry Station intersection should be signalized with a timing pattern optimized for through traffic on US 101. Analysis of the signalized intersection indicates that a LOS “B” can be maintained for US 101 through traffic; however, major street left-turns and all minor street movements are LOS “E” in 2031.

All other NHE alternative intersections are two-way stop-controlled. A private road intersection (Private (A) – Figure III-16 & 17), south of Henry Station, will remain LOS “F”. Traffic volumes from the minor approach should be able to access US 101, but with major delay. Other intersections are right-in/right-out only and should not have any significant delays.

Expressway speeds are lower than the freeway speeds. In 2021, average speed on US 101 southbound is estimated to be 59.59 mph and northbound is 58.10 mph. In 2031, speeds decrease to 55.79 southbound and 52.52 mph northbound.
In general, the NHE alternative will decrease average speed, increase travel time and delay when compared to the freeway alternatives.

IV. CONCLUSIONS

The following is a summary of the conclusions of this report:

- US 101 traffic currently experiences poor level of service (LOS “E”) in Downtown Hopland.

- Parking and pedestrian activity in Downtown Hopland create conflicts that contribute to poor LOS.

- US 101 traffic through Downtown Hopland routinely exceeds the posted 35-mph speed limit.

- US 101 Traffic through Downtown Hopland is projected to double by the year 2031.

- If no bypass is constructed future traffic through Hopland will become so concentrated in platoons that vehicles attempting turns from connecting roadways will suffer delays counted in minutes.

- Vehicles attempting left-turns onto US 101 from SR 175 and Mountain House Road will be unable to do so in the future without signalization of the intersections. Signalization will increase delay for interregional traffic.

- Delay in and around Hopland will increase substantially if no bypass is constructed. Current average peak hour delay in the study network is estimated to be 57 hours. By the year 2031, if no bypass is constructed, delay will increase by over 400% to 242 hours, On an annual basis, this will represent about 78,000 hours of peak hour delay.

- Each one of the Hopland Bypass and North Hopland full freeway alternatives will reduce network delay to below existing levels.

- There will be very little, if any delay for traffic on a bypass freeway. Most system delay will be local delay.

- Travel time on the proposed freeway bypass alternatives will be between 2.8 and 3.3 minutes faster than the No-Build alternative.

- Average daily traffic in 2031 is projected to be about 32,000 vehicles per day. An O/D study completed for this report estimates that about 70 percent of the traffic on US 101 is interregional through traffic. At a minimum in 2031, a freeway bypass around Hopland will save about 3 minutes in travel time for interregional traffic. Cumulatively, interregional traffic would save about 67,200 minutes or 1120 hours per day. Annually that represents a timesaving of over 400,000 hours.

- There will be no significant difference in traffic performance and operation with any one of the North Hopland Freeway alternatives.

- A North Hopland Expressway will cause small increases in delay and travel time.

- Signalization will be required at the US 101 and Henry Station Intersection if a North Hopland Expressway is constructed.

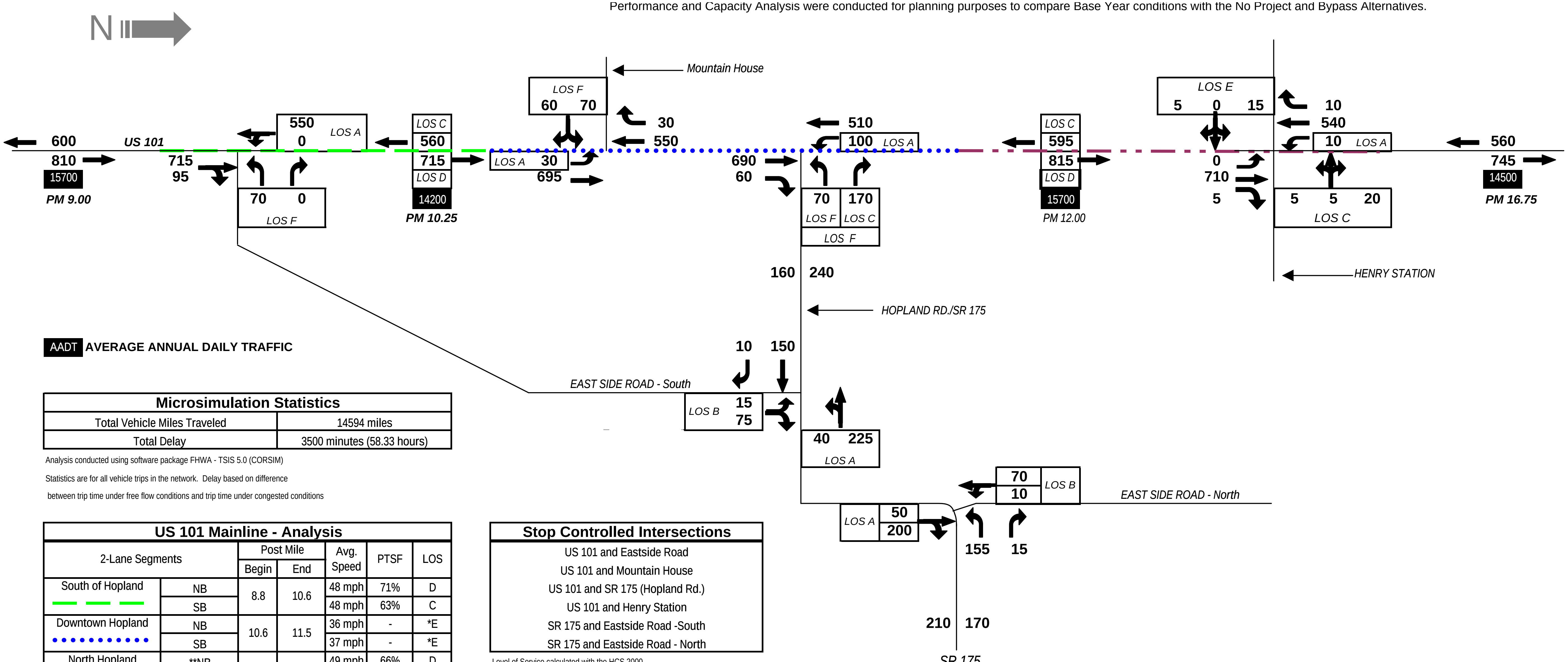
FIGURE III-1

HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2001 - Base Year - Existing Conditions

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS

Performance and Capacity Analysis were conducted for planning purposes to compare Base Year conditions with the No Project and Bypass Alternatives.



AADT AVERAGE ANNUAL DAILY TRAFFIC

Microsimulation Statistics

Total Vehicle Miles Traveled	14594 miles
Total Delay	3500 minutes (58.33 hours)

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

US 101 Mainline - Analysis

2-Lane Segments		Post Mile Begin	Post Mile End	Avg. Speed	PTSF	LOS
South of Hopland	NB	8.8	10.6	48 mph	71%	D
	SB			48 mph	63%	C
Downtown Hopland	NB	10.6	11.5	36 mph	-	*E
	SB			37 mph	-	*E
North Hopland	**NB	11.5	17.6	49 mph	66%	D
	**SB			53 mph	51%	C

Analysis conducted using FHWA TSIS 5.0 and TWOPAS98 simulation software

Speeds derived from CORSIM simulation

PTSF - Percent Time Spent Following derived from TWOPAS98 simulation

*Posted speed limits are below HCM LOS E standards for 2-lane highways, but volume does not exceed capacity

** Includes passing lane segments

LOS based on Exhibit 20-2 - Highway Capacity Manual 2000

Stop Controlled Intersections

Stop Controlled Intersections
US 101 and Eastside Road
US 101 and Mountain House
US 101 and SR 175 (Hopland Rd.)
US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North

Level of Service calculated with the HCS 2000 based on Highway Capacity Manual 2000 methodology

PM Peak Hour is 4-5 pm

Traffic volumes are a composite of traffic counts conducted during peak traffic periods on Fridays in May 2000, July 2000, and Oct 2001.

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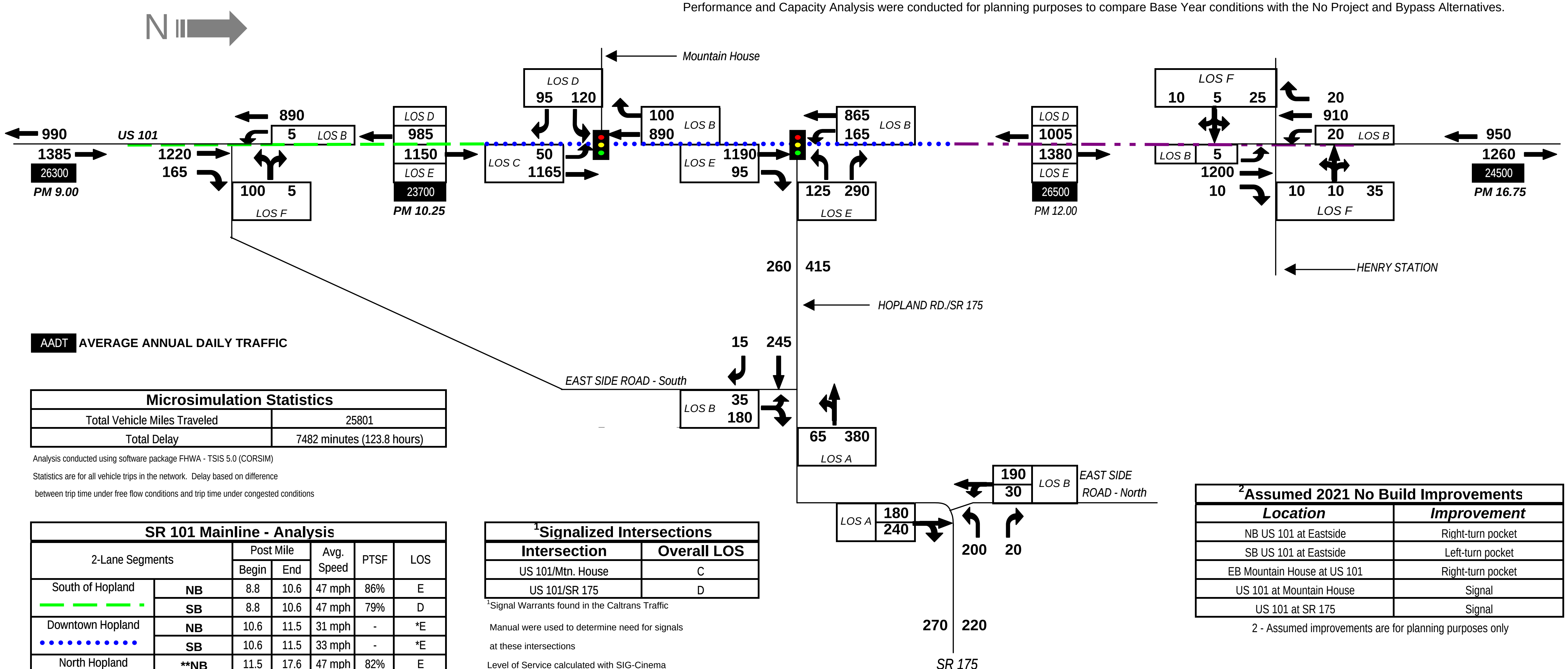
HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2021 - No Build - Future Conditions

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS

Performance and Capacity Analysis were conducted for planning purposes to compare Base Year conditions with the No Project and Bypass Alternatives.



Microsimulation Statistics	
Total Vehicle Miles Traveled	25801
Total Delay	7482 minutes (123.8 hours)

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

SR 101 Mainline - Analysis

2-Lane Segments		Post Mile Begin	Post Mile End	Avg. Speed	PTSF	LOS
South of Hopland	NB	8.8	10.6	47 mph	86%	E
	SB	8.8	10.6	47 mph	79%	D
Downtown Hopland	NB	10.6	11.5	31 mph	-	*E
	SB	10.6	11.5	33 mph	-	*E
North Hopland	**NB	11.5	17.6	47 mph	82%	E
	**SB	11.5	17.6	50 mph	71%	D

Analysis conducted using FHWA TSIS 5.0 and TWOPAS98 simulation software

Speeds derived from CORSIM simulation

PTSF - Percent Time Spent Following derived from TWOPAS98 simulation

*Posted speed limits are below HCM LOS E standards for 2-lane highways, but volume does not exceed capacity

** Includes passing lane segments

LOS based on Exhibit 20-2 - Highway Capacity Manual 2000

[1]Signalized Intersections

Intersection	Overall LOS
US 101/Mtn. House	C
US 101/SR 175	D

[1]Signal Warrants found in the Caltrans Traffic Manual were used to determine need for signals at these intersections

Level of Service calculated with SIG-Cinema

Stop Controlled Intersections

US 101 and Eastside Road
US 101 and Henry Station
US 175 and Eastside Road -South
US 175 and Eastside Road - North

Level of Service calculated with the HCS 2000 based on Highway Capacity Manual 2000 methodology

PM Peak Hour is 4-5 pm

Traffic volumes are based on the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

[2]Assumed 2021 No Build Improvements

Location	Improvement
NB US 101 at Eastside	Right-turn pocket
SB US 101 at Eastside	Left-turn pocket
EB Mountain House at US 101	Right-turn pocket
US 101 at Mountain House	Signal
US 101 at SR 175	Signal

2 - Assumed improvements are for planning purposes only

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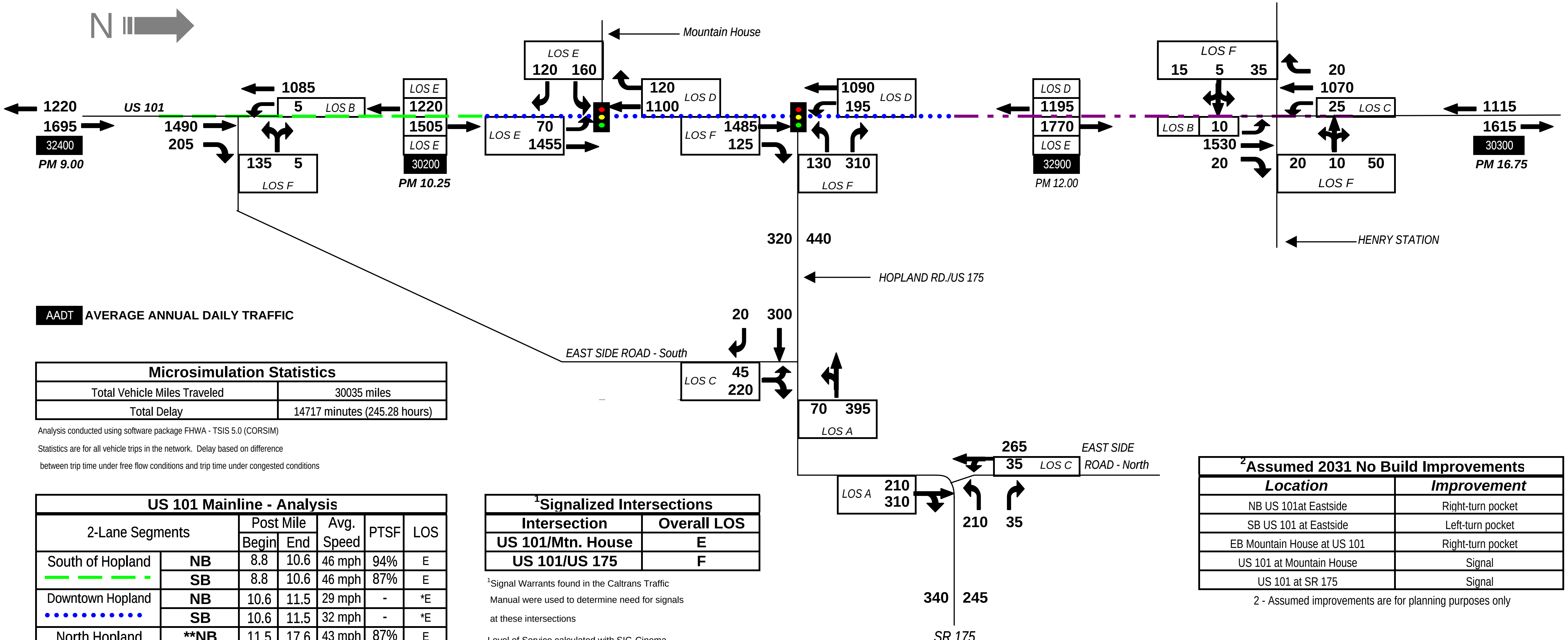
HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2031 - No Build - Future Conditions

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS

Performance and Capacity Analysis were conducted for planning purposes to compare Base Year conditions with the No Project and Bypass Alternatives.



Microsimulation Statistics	
Total Vehicle Miles Traveled	30035 miles
Total Delay	14717 minutes (245.28 hours)

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)
Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

US 101 Mainline - Analysis

2-Lane Segments		Post Mile Begin	Post Mile End	Avg. Speed	PTSF	LOS
South of Hopland	NB	8.8	10.6	46 mph	94%	E
	SB	8.8	10.6	46 mph	87%	E
Downtown Hopland	NB	10.6	11.5	29 mph	-	*E
	SB	10.6	11.5	32 mph	-	*E
North Hopland	**NB	11.5	17.6	43 mph	87%	E
	**SB	11.5	17.6	50 mph	78%	D

Analysis conducted using FHWA TSIS 5.0 and TWOPAS98 simulation software
Speeds derived from CORSIM simulation
PTSF - Percent Time Spent Following derived from TWOPAS98 simulation
*Posted speed limits are below HCM LOS E standards for 2-lane highways and traffic volumes are approaching capacity
** Includes passing lane segments
LOS based on Exhibit 20-2 - Highway Capacity Manual 2000

[1]Signalized Intersections

Intersection	Overall LOS
US 101/Mtn. House	E
US 101/US 175	F

[1]Signal Warrants found in the Caltrans Traffic Manual were used to determine need for signals at these intersections

Level of Service calculated with SIG-Cinema

Stop Controlled Intersections
US 101 and Eastside Road
US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North

Level of Service calculated with the HCS 2000 based on Highway Capacity Manual 2000 methodology

[2]Assumed 2031 No Build Improvements

Location	Improvement
NB US 101at Eastside	Right-turn pocket
SB US 101 at Eastside	Left-turn pocket
EB Mountain House at US 101	Right-turn pocket
US 101 at Mountain House	Signal
US 101 at SR 175	Signal

2 - Assumed improvements are for planning purposes only

PM Peak Hour is 4-5 pm
Forecasted traffic volumes were formulated through linear regression based on the forecasted traffic volumes from the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

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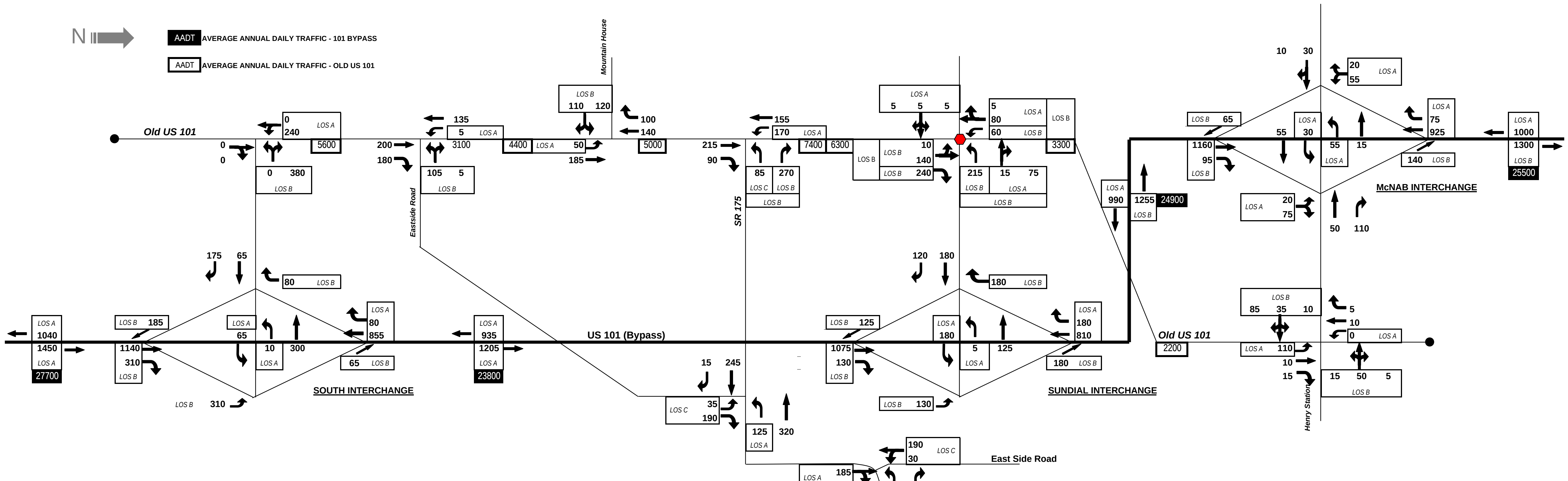
HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2021 - Valley West #2 and Valley East #2/North Hopland Alternative

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS



Microsimulation Statistics	
Total Vehicle Miles Traveled	28824
Total Delay	2168 minutes (36.14 hours)
Average Freeway (Bypass) Speed	63.13 MPH

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

Two-Way Stop Controlled Intersections
Old US 101 and Eastside Road
Old US 101 and Mountain House
Old US 101 and SR 175 (Hopland Rd.)
Old US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North
Old US 101 and South IC Access Rd
All Offramps
All-Way Stop Controlled Intersections
Old US 101 and Sundial IC Access Rd.

Level of Service calculated with the HCS 2000

based on Highway Capacity Manual 2000 methodology

PM Peak Hour is 4-5 pm

Forecasted traffic volumes were formulated through linear regression based on the forecasted traffic volumes from the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

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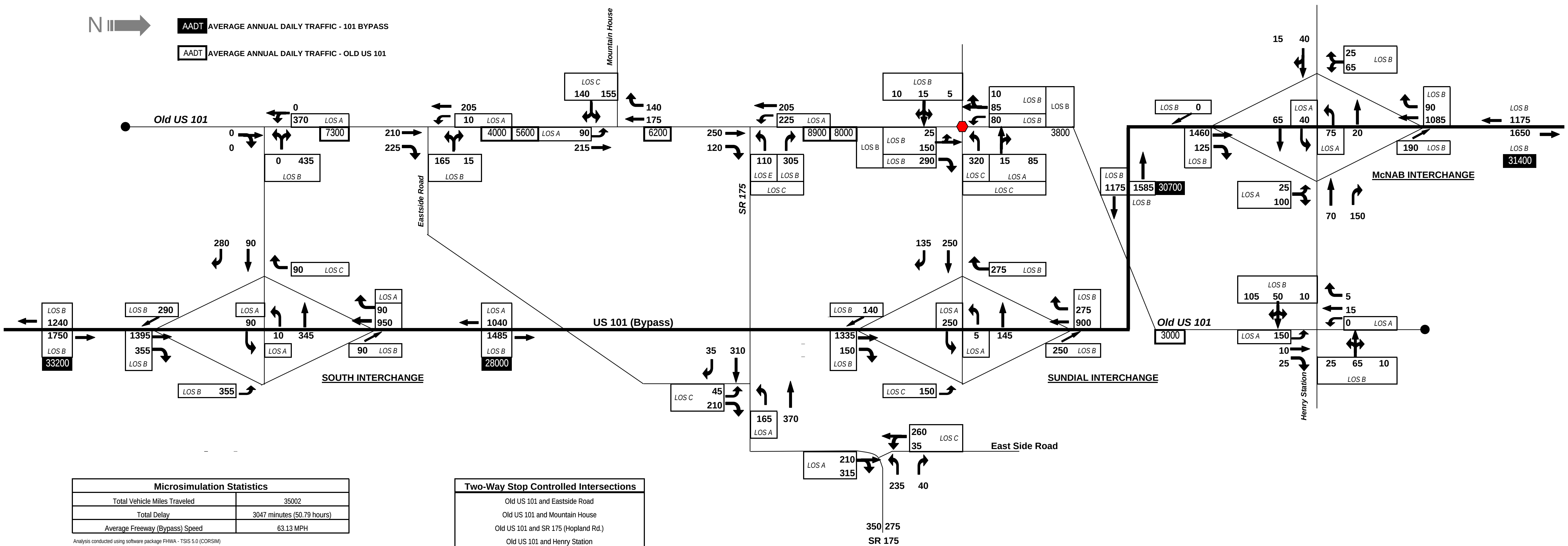
HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2031 - Valley West #2 and Valley East #2/North Hopland Alternative

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS



Microsimulation Statistics	
Total Vehicle Miles Traveled	35002
Total Delay	3047 minutes (50.79 hours)
Average Freeway (Bypass) Speed	63.13 MPH

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

Two-Way Stop Controlled Intersections
Old US 101 and Eastside Road
Old US 101 and Mountain House
Old US 101 and SR 175 (Hopland Rd.)
Old US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North
Old US 101 and South IC Access Rd
All Offramps
All-Way Stop Controlled Intersections
Old US 101 and Sundial IC Access Rd.

Level of Service calculated with the HCS 2000

based on Highway Capacity Manual 2000 methodology

PM Peak Hour is 4-5 pm

Forecasted traffic volumes were formulated through linear regression based on the forecasted traffic volumes from the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

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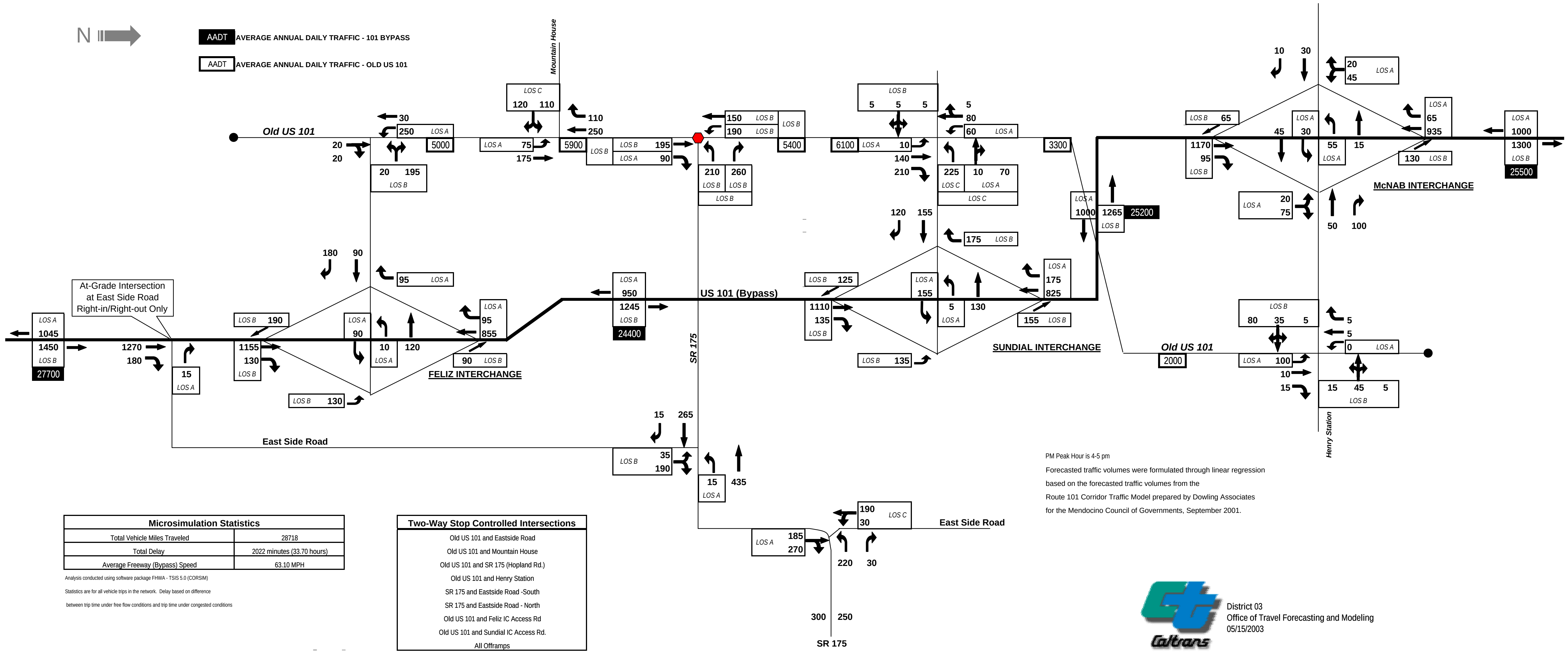
FIGURE III-6

HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2021 - Valley West #3/North Hopland Alternative

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS



PM Peak Hour is 4-5 pm

Forecasted traffic volumes were formulated through linear regression based on the forecasted traffic volumes from the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

Microsimulation Statistics	
Total Vehicle Miles Traveled	28718
Total Delay	2022 minutes (33.70 hours)
Average Freeway (Bypass) Speed	63.10 MPH

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

Two-Way Stop Controlled Intersections
Old US 101 and Eastside Road
Old US 101 and Mountain House
Old US 101 and SR 175 (Hopland Rd.)
Old US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North
Old US 101 and Feliz IC Access Rd
Old US 101 and Sundial IC Access Rd.
All Offramps

Level of Service calculated with the HCS 2000 based on Highway Capacity Manual 2000 methodology

District 03
Office of Travel Forecasting and Modeling
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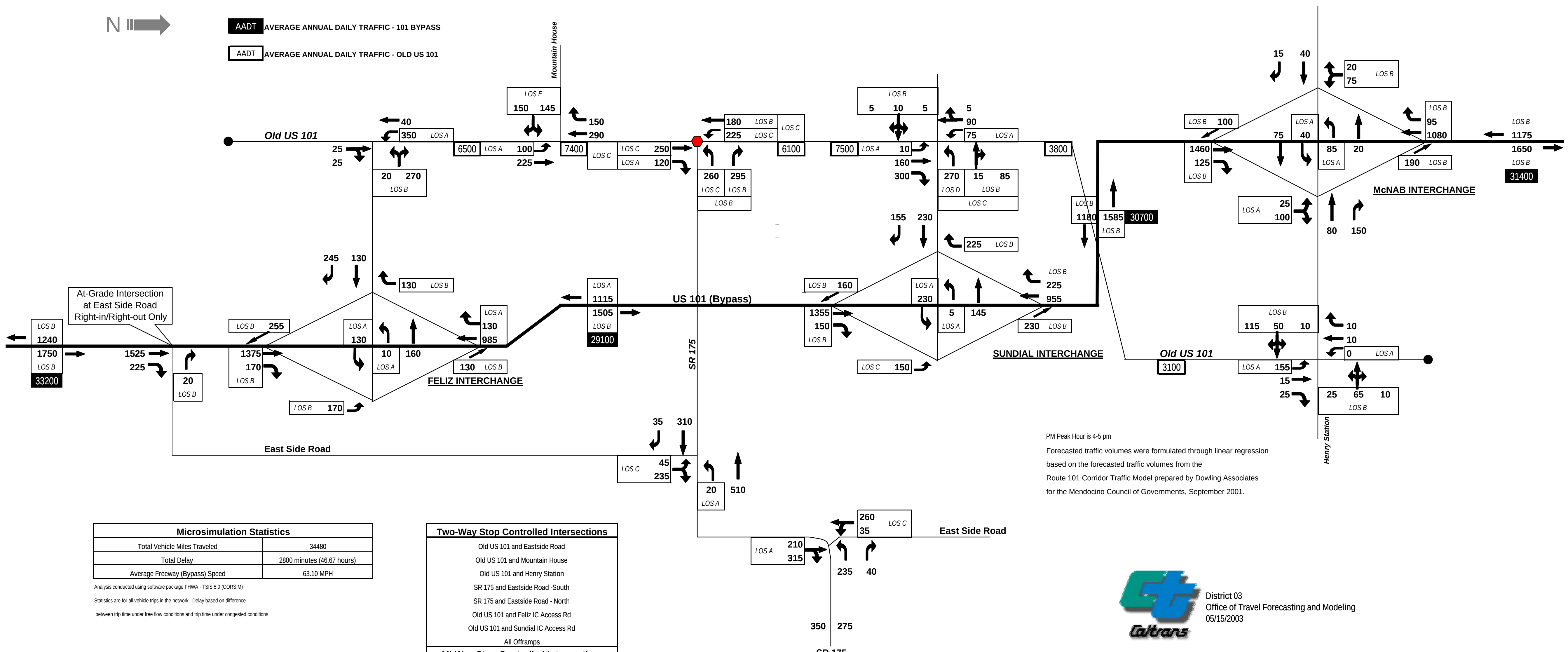
HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2031 - Valley West #3/North Hopland Alternative

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS



PM Peak Hour is 4-5 pm

Forecasted traffic volumes were formulated through linear regression based on the forecasted traffic volumes from the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

Microsimulation Statistics	
Total Vehicle Miles Traveled	34480
Total Delay	2800 minutes (46.67 hours)
Average Freeway (Bypass) Speed	63.10 MPH

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

Two-Way Stop Controlled Intersections
Old US 101 and Eastside Road
Old US 101 and Mountain House
Old US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North
Old US 101 and Feliz IC Access Rd
Old US 101 and Sundial IC Access Rd
All Offramps
All-Way Stop Controlled Intersections
Old US 101 and SR 175 (Hopland Rd.)

Level of Service calculated with the HCS 2000 based on Highway Capacity Manual 2000 methodology

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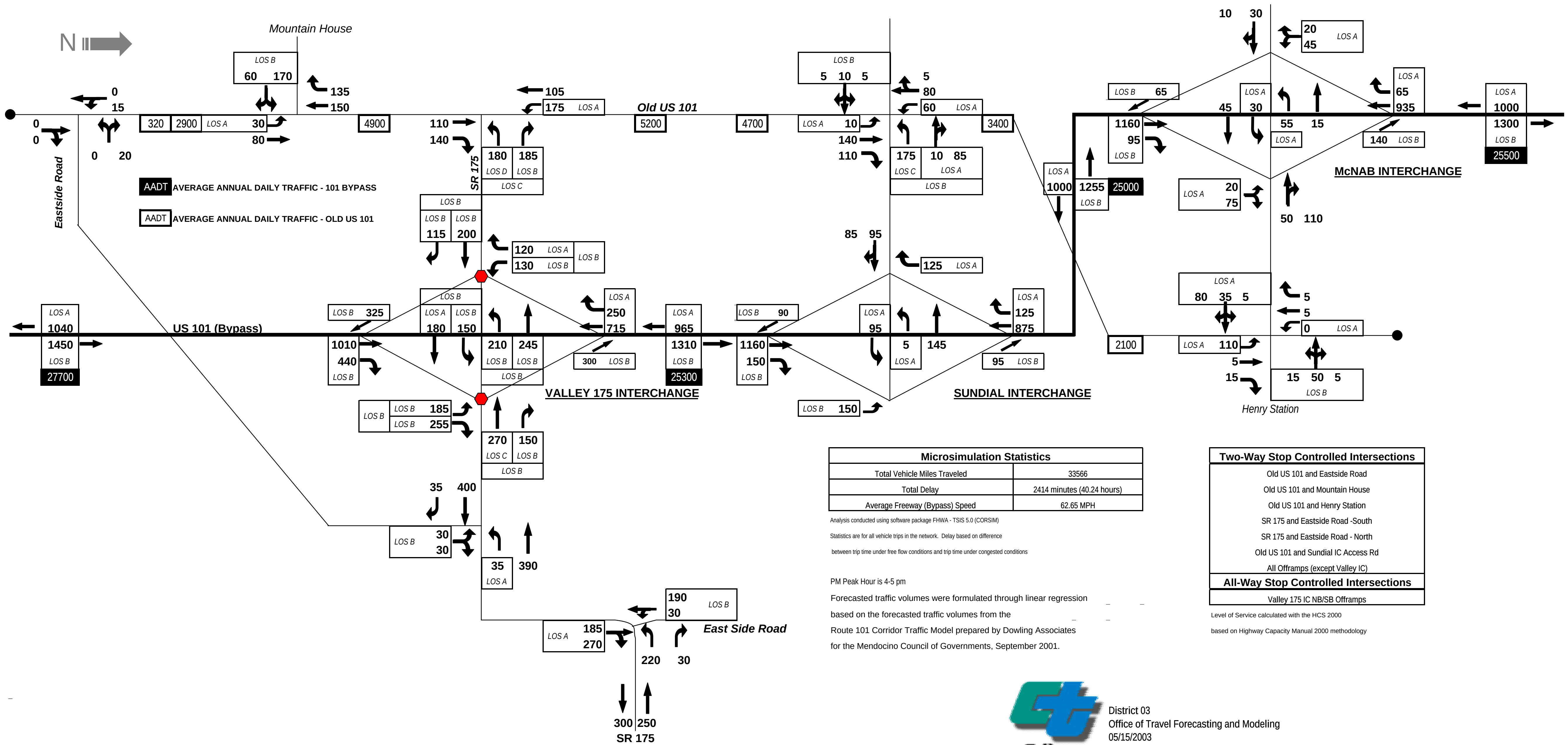
HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2021 - Valley East #3/North Hopland Alternative

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS



Microsimulation Statistics	
Total Vehicle Miles Traveled	33566
Total Delay	2414 minutes (40.24 hours)
Average Freeway (Bypass) Speed	62.65 MPH

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

PM Peak Hour is 4-5 pm

Forecasted traffic volumes were formulated through linear regression based on the forecasted traffic volumes from the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

Two-Way Stop Controlled Intersections
Old US 101 and Eastside Road
Old US 101 and Mountain House
Old US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North
Old US 101 and Sundial IC Access Rd
All Offramps (except Valley IC)
All-Way Stop Controlled Intersections
Valley 175 IC NB/SB Offramps

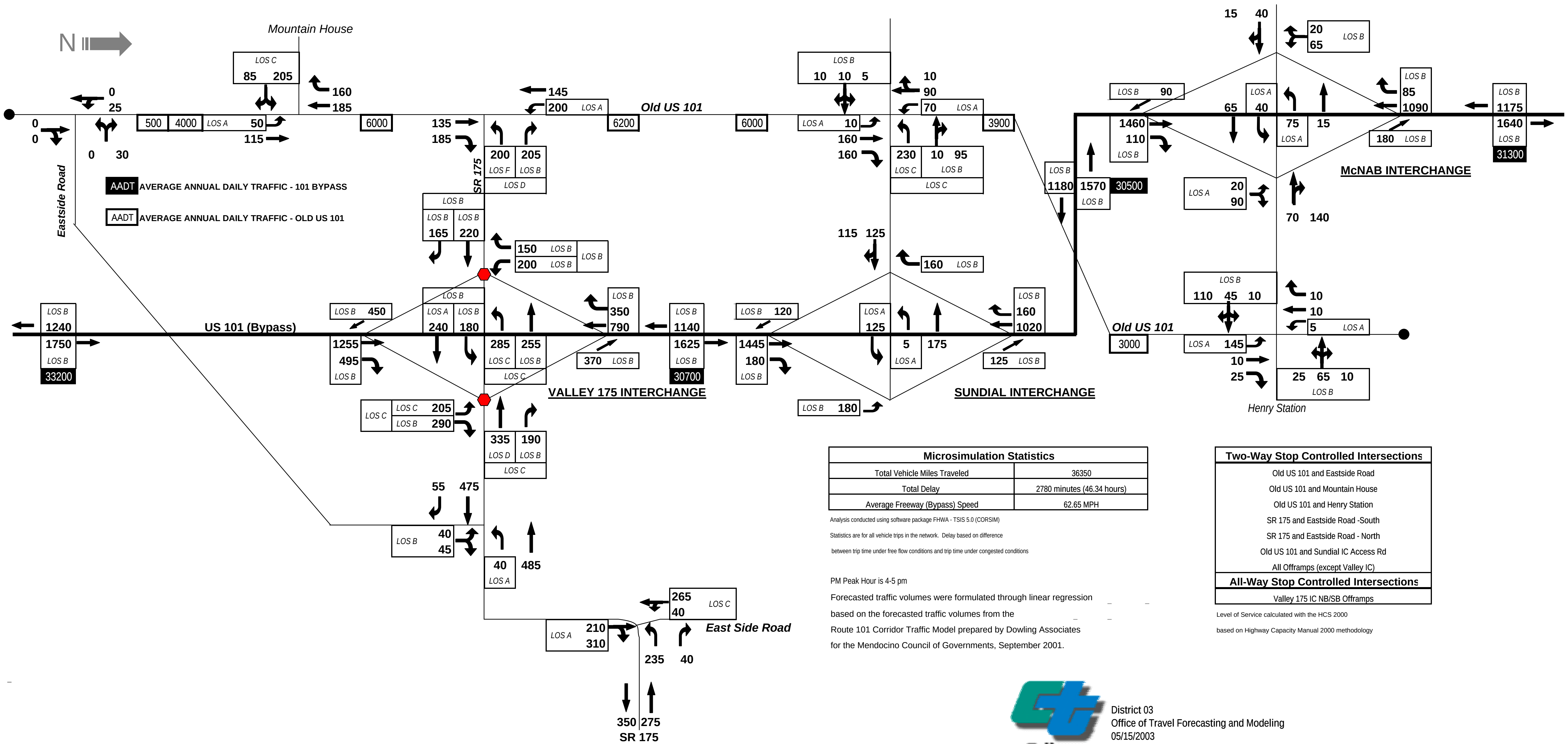
Level of Service calculated with the HCS 2000 based on Highway Capacity Manual 2000 methodology

District 03
Office of Travel Forecasting and Modeling
05/15/2003

HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2031 - Valley East #3/North Hopland Alternative

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS



Microsimulation Statistics	
Total Vehicle Miles Traveled	36350
Total Delay	2780 minutes (46.34 hours)
Average Freeway (Bypass) Speed	62.65 MPH

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

PM Peak Hour is 4-5 pm

Forecasted traffic volumes were formulated through linear regression based on the forecasted traffic volumes from the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

Two-Way Stop Controlled Intersections
Old US 101 and Eastside Road
Old US 101 and Mountain House
Old US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North
Old US 101 and Sundial IC Access Rd
All Offramps (except Valley IC)
All-Way Stop Controlled Intersections
Valley 175 IC NB/SB Offramps

Level of Service calculated with the HCS 2000 based on Highway Capacity Manual 2000 methodology

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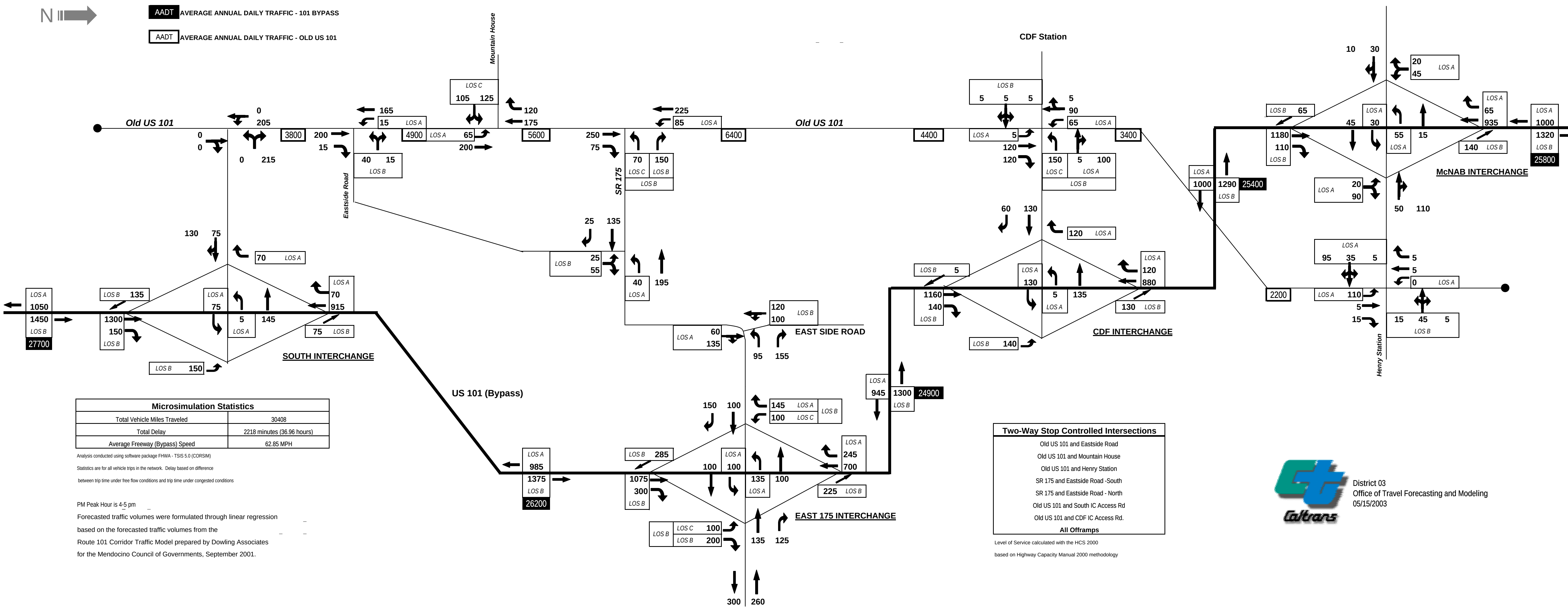
HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2021 - East/North Hopland Freeway Alternative

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS



Microsimulation Statistics	
Total Vehicle Miles Traveled	30408
Total Delay	2218 minutes (36.96 hours)
Average Freeway (Bypass) Speed	62.85 MPH

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

PM Peak Hour is 4-5 pm

Forecasted traffic volumes were formulated through linear regression based on the forecasted traffic volumes from the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

Two-Way Stop Controlled Intersections
Old US 101 and Eastside Road
Old US 101 and Mountain House
Old US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North
Old US 101 and South IC Access Rd
Old US 101 and CDF IC Access Rd.
All Offramps

Level of Service calculated with the HCS 2000 based on Highway Capacity Manual 2000 methodology

District 03
Office of Travel Forecasting and Modeling
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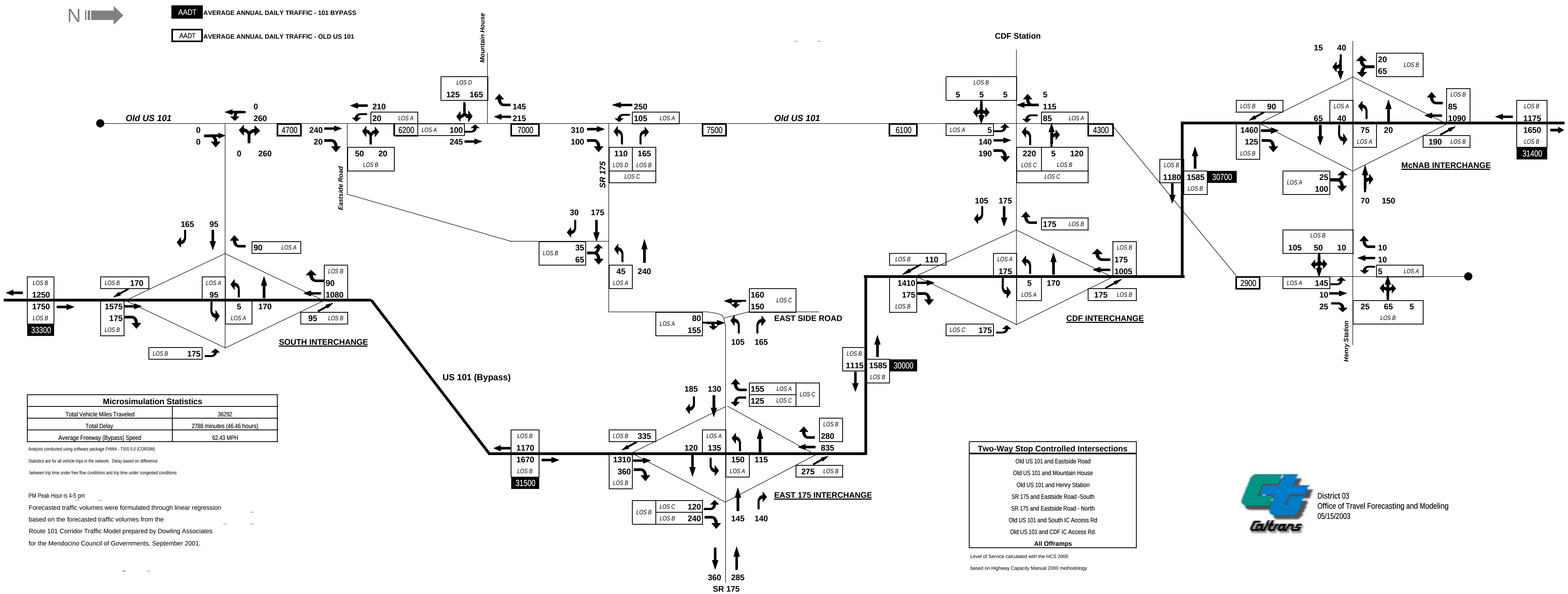
HOPLAND BYPASS/NORTH HOPLAND PM 8.80/17.60 EA 2921U0

2031 - East/North Hopland Freeway Alternative

PM PEAK HOUR TRAFFIC VOLUMES, TURN MOVEMENTS, AADT, and LOS



Microsimulation Statistics	
Total Vehicle Miles Traveled	36292
Total Delay	2788 minutes (46.46 hours)
Average Freeway (Bypass) Speed	62.43 MPH

Analysis conducted using software package FHWA - TSIS 5.0 (CORSIM)

Statistics are for all vehicle trips in the network. Delay based on difference between trip time under free flow conditions and trip time under congested conditions

PM Peak Hour is 4-5 pm

Forecasted traffic volumes were formulated through linear regression based on the forecasted traffic volumes from the Route 101 Corridor Traffic Model prepared by Dowling Associates for the Mendocino Council of Governments, September 2001.

Two-Way Stop Controlled Intersections
Old US 101 and Eastside Road
Old US 101 and Mountain House
Old US 101 and Henry Station
SR 175 and Eastside Road -South
SR 175 and Eastside Road - North
Old US 101 and South IC Access Rd
Old US 101 and CDF IC Access Rd.
All Offramps

Level of Service calculated with the HCS 2000 based on Highway Capacity Manual 2000 methodology

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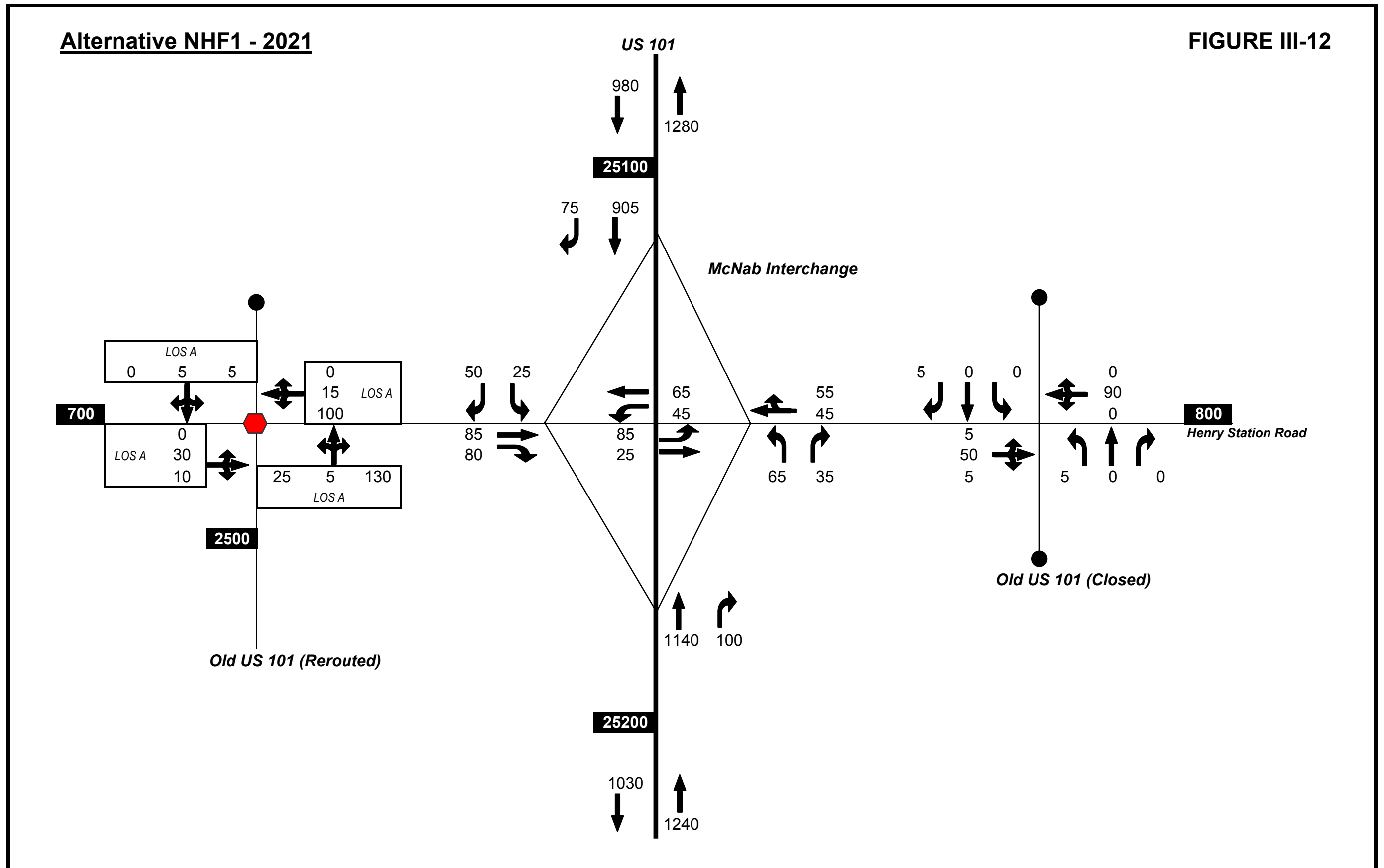
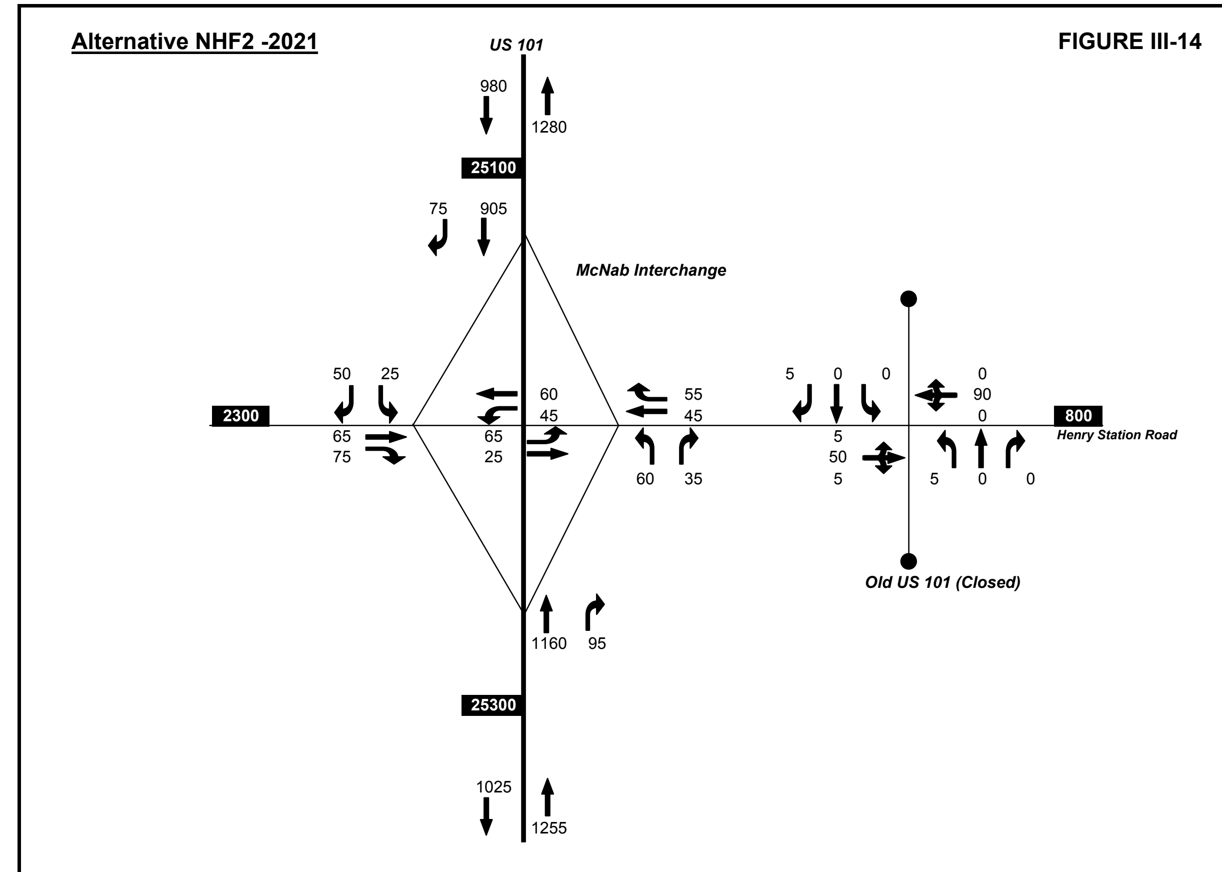
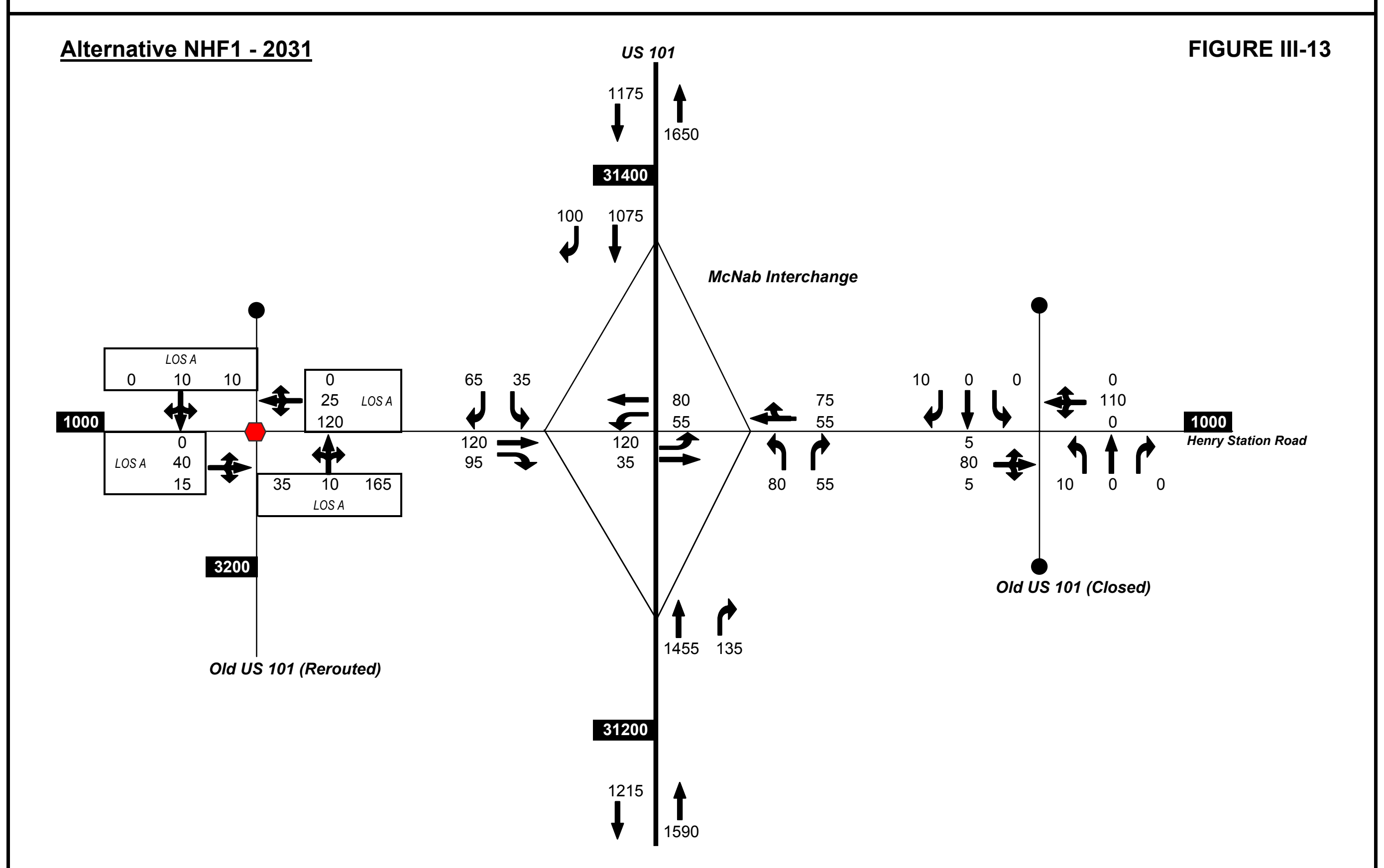
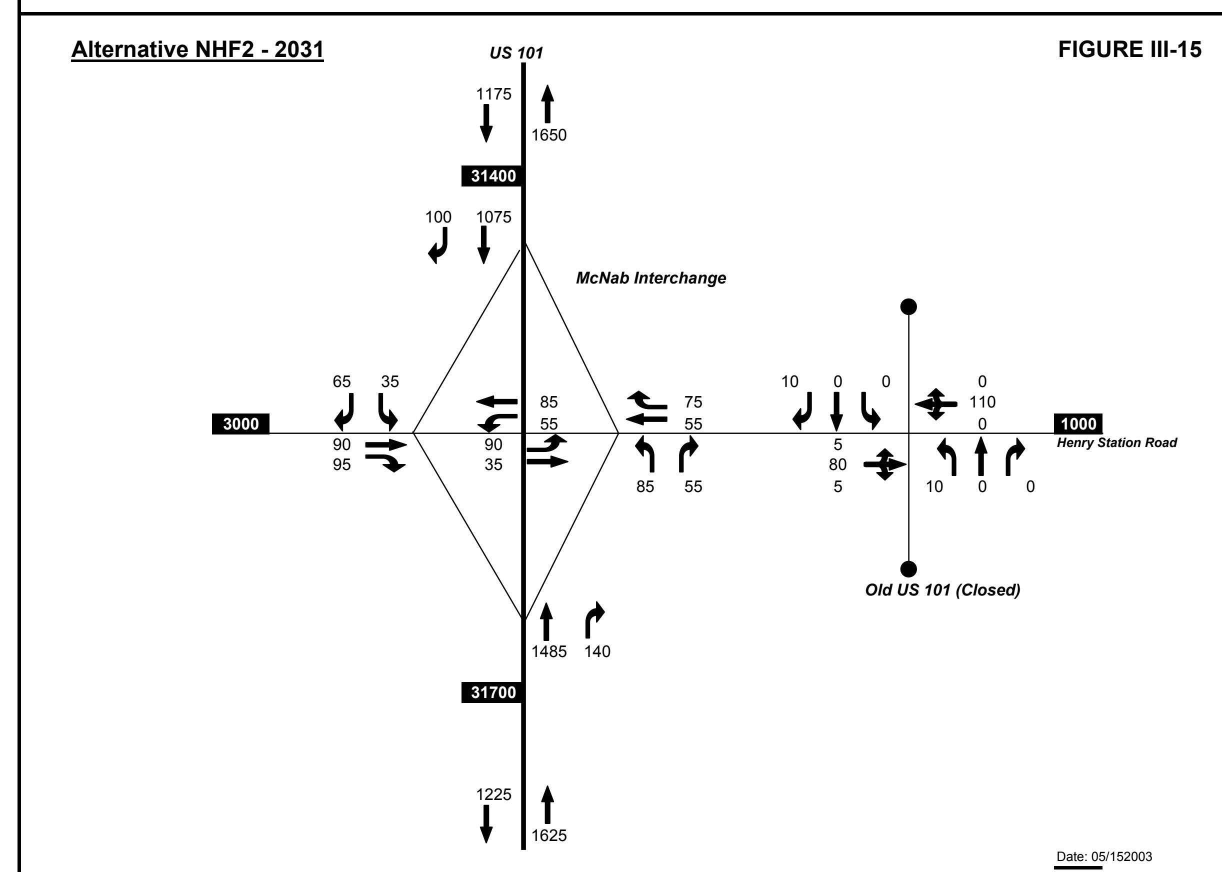
HOPLAND BYPASS - North Hopland Freeway Alternatives

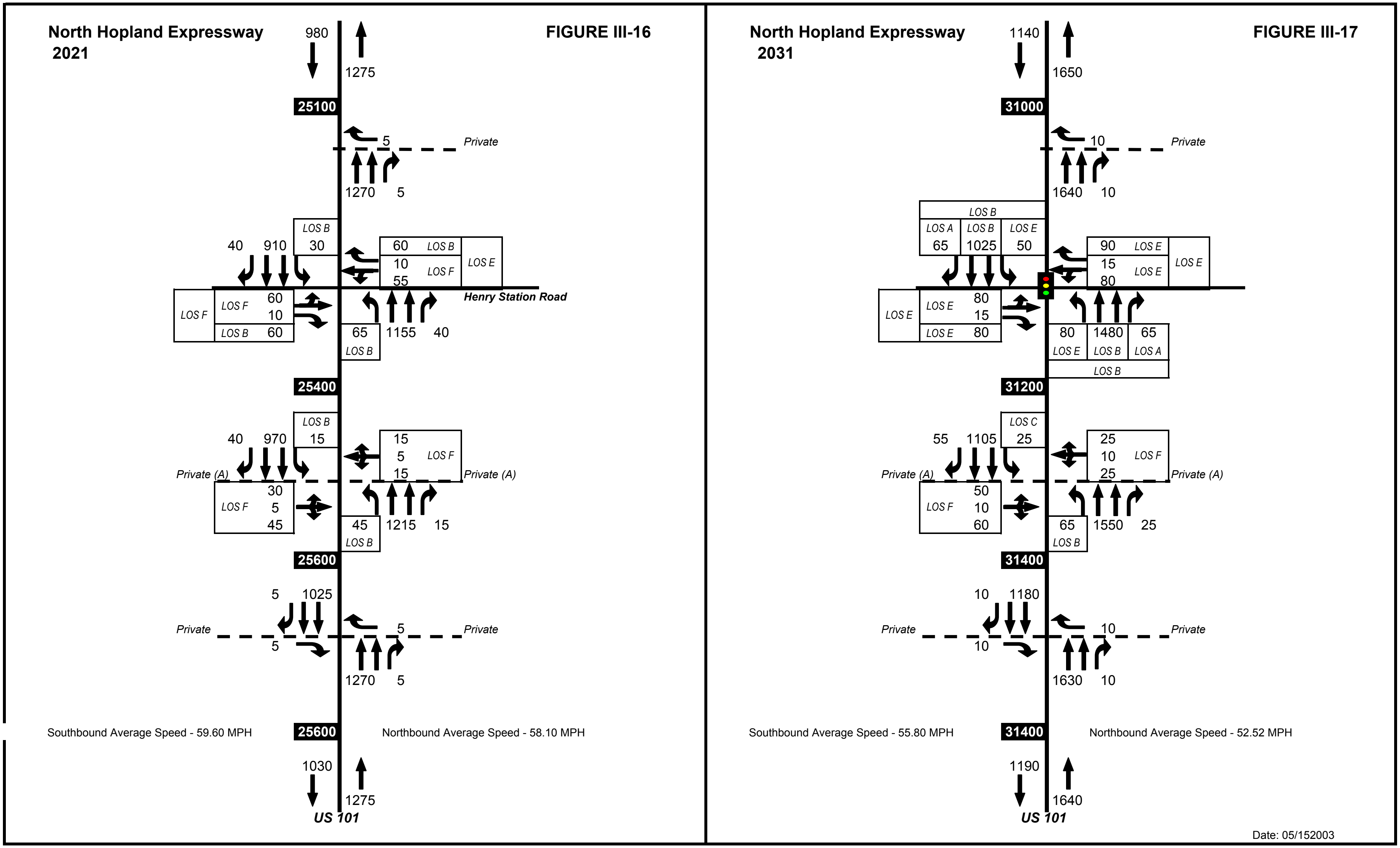
EA 01-2921U0







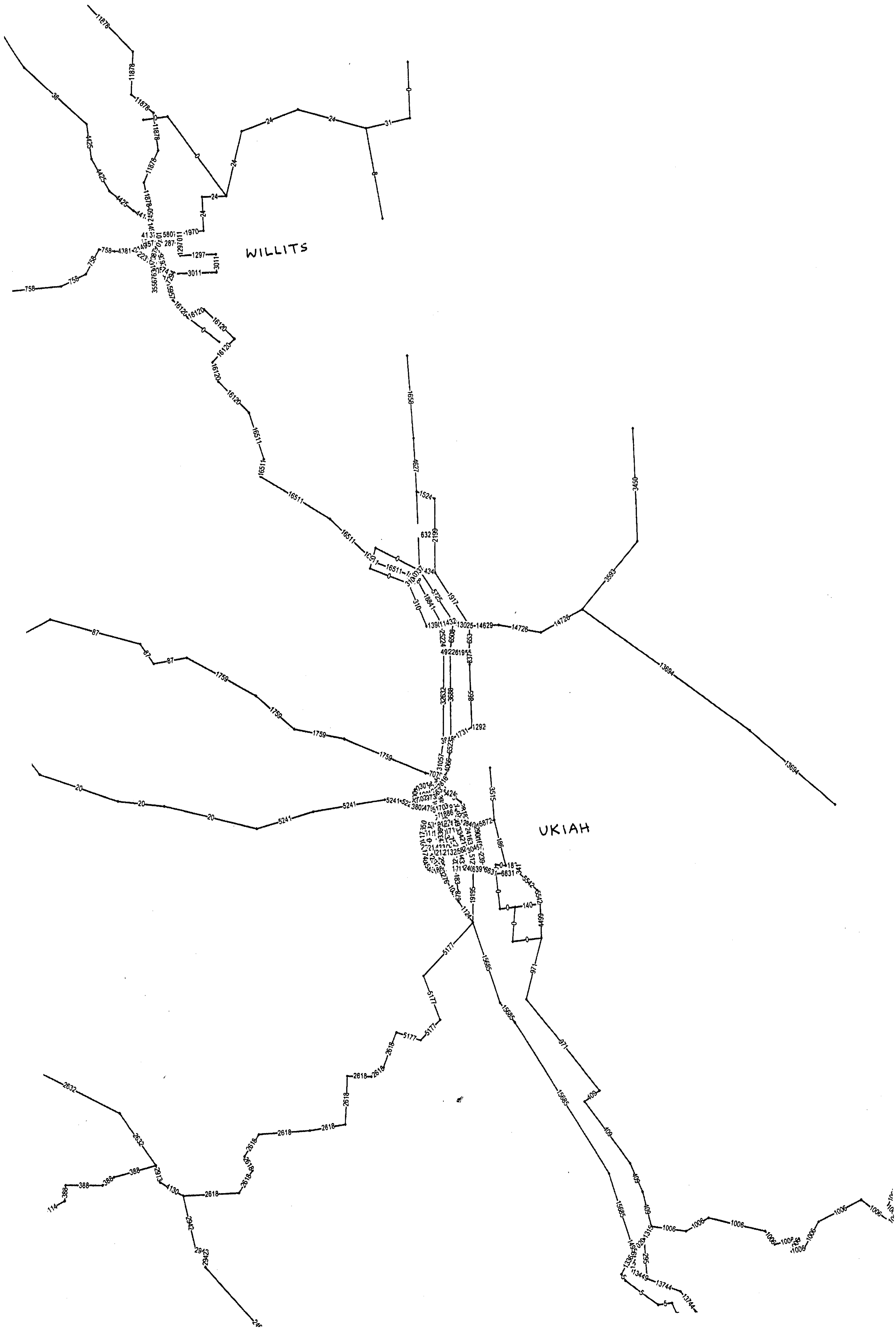




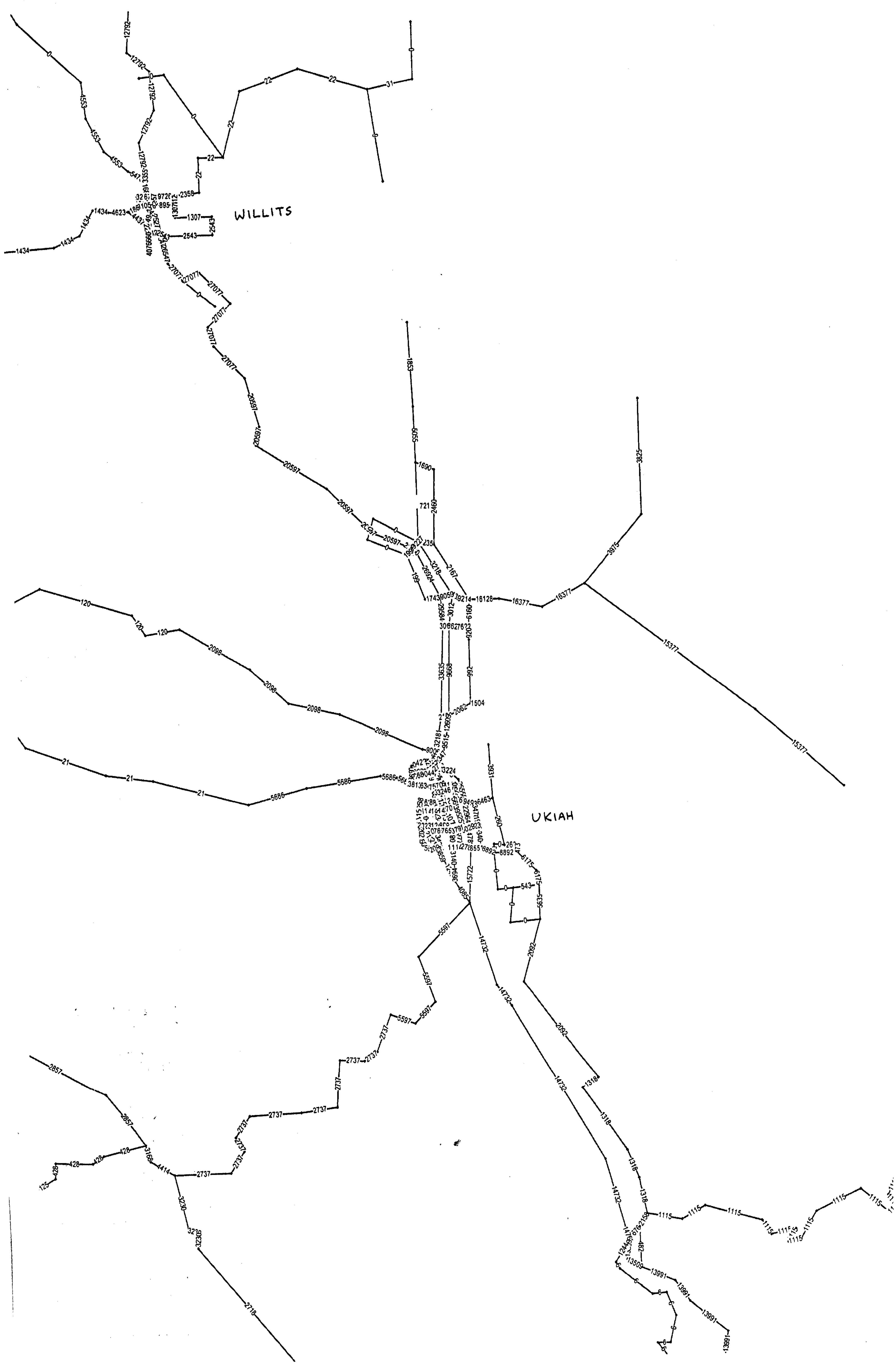
North Hopland Expressway
2021
FIGURE III-16
980
1275
25100
5
Private
1270 5
LOS B
40 910 30
60 LOS B
10 LOS F
55
LOS E
Henry Station Road
LOS F
LOS F 60
10
LOS B 60
65 1155 40
LOS B
25400
LOS B
40 970 15
15
5 LOS F
15
Private (A)
Private (A)
30
LOS F 5
45
45 1215 15
LOS B
25600
5 1025
Private
5
5
Private
1270 5
Southbound Average Speed - 59.60 MPH
25600
Northbound Average Speed - 58.10 MPH
1030
1275
US 101
North Hopland Expressway
2031
FIGURE III-17
1140
1650
31000
10
Private
1640 10
LOS B
LOS A LOS B LOS E
65 1025 50
90 LOS E
15 LOS E
80
LOS E
LOS E
LOS E 80
15
LOS E 80
80 1480 65
LOS E LOS B LOS A
LOS B
31200
LOS C
55 1105 25
25
10 LOS F
25
Private (A)
Private (A)
50
LOS F 10
60
65 1550 25
LOS B
31400
10 1180
Private
10
10
Private
1630 10
Southbound Average Speed - 55.80 MPH
31400
Northbound Average Speed - 52.52 MPH
1190
1640
US 101
Date: 05/152003

Appendix A – Route 101 Corridor Traffic Model – AADT Outpu

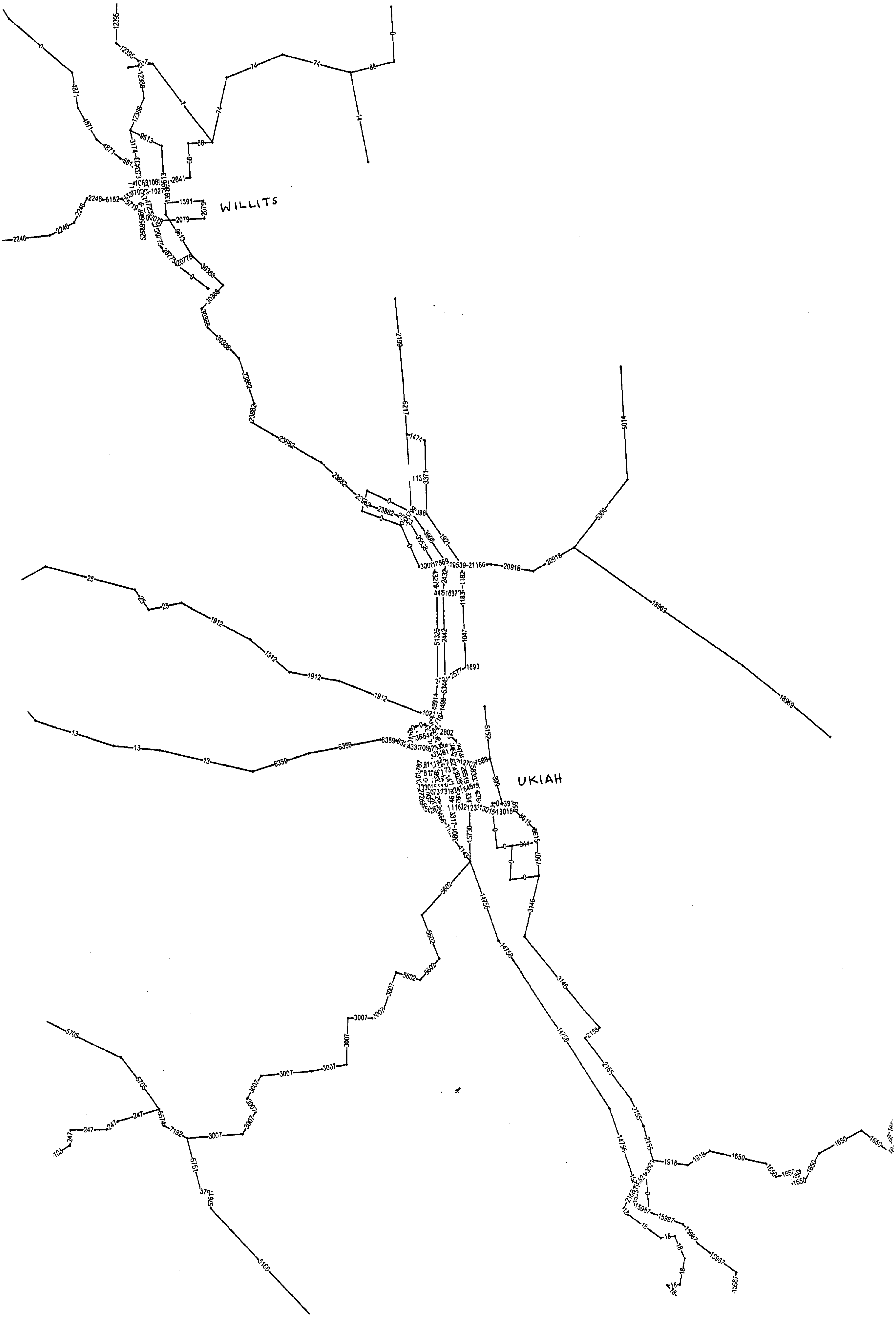
1997 Total ADT



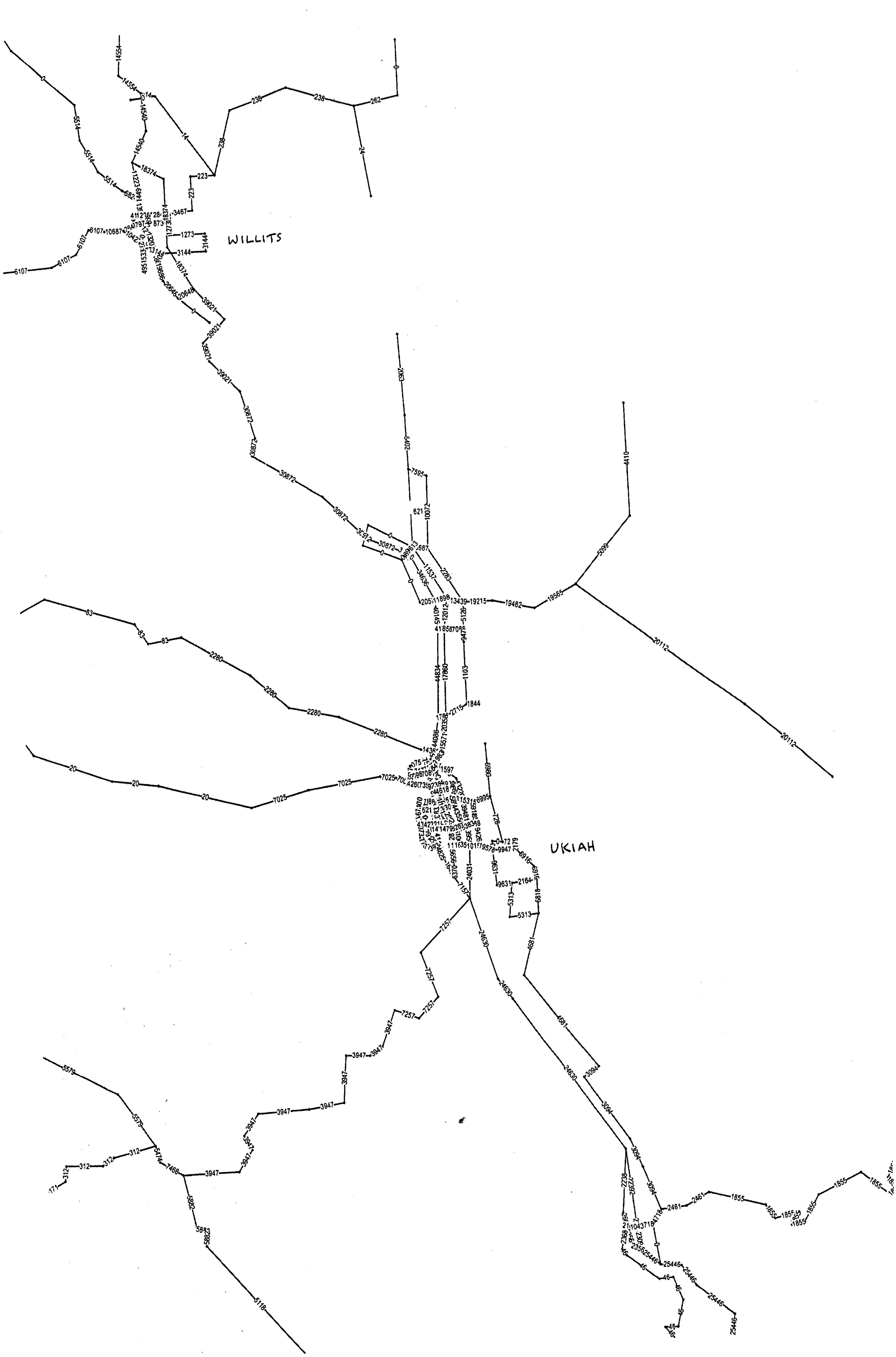
2005 Total ADT



2010 Total ADT



2020 Total ADT



Appendix B – Microsimulation Cumulative Statistics

HOPLAND BYPASS

NETSIM AVERAGE STATISTICS - MULTIPLE SIMULATIONS

				HOURS			MINUTES/MILE		MINUTES/TRIP		CNTRL	QUEUE	STOP		
	VEHICLE		MOVE	DELAY	TOTAL	MOVE/	TOTAL	DELAY	TOTAL	DELAY	DELAY	DELAY	DELAY	%	AVG
	MILES	TRIPS	TIME	TIME	TIME	RATIO	TIME	TIME	TIME	TIME	TIME	TIME	TIME	STOPS	SPD
BASE YEAR	14594.43	2026.73	263.30	57.16	320.45	0.82	1.32	0.24	8.17	1.46	0.20	0.07	0.06	69.77	45.53
NO BUILD 2021	25801.42	3474.82	458.06	126.83	584.88	0.78	1.36	0.29	8.66	1.88	0.50	0.31	0.28	135.35	44.12
NO BUILD 2031	30035.01	3984.27	532.97	242.44	775.42	0.69	1.55	0.49	9.71	3.10	1.43	0.97	0.87	207.52	38.75
EAST FRWY 2021	4608.64	3232.27	104.92	23.83	128.74	0.81	1.68	0.31	2.30	0.42	0.13	0.09	0.07	141.16	35.79
EAST FRWY 2031	5242.76	3705.09	112.34	27.23	139.56	0.80	1.60	0.31	2.18	0.42	0.14	0.09	0.08	144.39	37.57
VE3 2021	4621.07	3478.30	103.84	23.57	127.41	0.82	1.66	0.31	2.12	0.39	0.14	0.09	0.08	135.92	36.27
VE3 2031	5038.26	3549.10	108.71	25.61	134.31	0.81	1.60	0.30	2.19	0.42	0.14	0.09	0.08	142.38	37.49
VW2VE2 2021	5149.92	2866.27	114.86	25.60	140.46	0.82	1.64	0.30	2.81	0.51	0.17	0.11	0.09	156.80	36.66
VW2VE2 2031	6383.69	3670.50	143.84	34.74	178.57	0.81	1.68	0.33	2.79	0.54	0.19	0.12	0.10	159.21	35.75
VW3 2021	4563.05	2748.10	105.01	22.74	127.75	0.82	1.68	0.30	2.67	0.48	0.16	0.10	0.08	146.27	35.71
VW3 2031	5464.59	3442.40	125.54	30.55	156.10	0.80	1.71	0.34	2.61	0.51	0.18	0.11	0.09	146.61	34.96

***FRESIM AVERAGE STATISTICS - MULTIPLE SIMULATIONS**

		TOTAL			VEHICLE		DELAY
	VEHICLE	VEHICLE	DELAY		MINUTES	AVG	MINUTES
	MILES	HOURS	HOURS		PER MILE	SPD	PER MILE
EAST FRWY 2021	25833.67	411.03	13.22	424.26	0.9536	62.85	0.0300
EAST FRWY 2031	31073.92	497.71	19.28	516.99	0.9600	62.43	0.0400
VE3 2021	28944.49	462.00	16.67	478.67	0.9600	62.65	0.0340
VE3 2031	31084.75	497.50	19.15	516.66	0.9600	62.48	0.0400
VW2VE2 2021	23674.25	375.01	10.54	385.55	0.9500	63.13	0.0300
VW2VE2 2031	28618.48	456.69	16.05	472.74	0.9600	62.67	0.0310
VW3 2021	24155.17	382.84	10.96	393.80	0.9500	63.10	0.0300
VW3 2031	29015.16	462.92	16.12	479.04	0.9600	62.68	0.0300

OVERALL NETWORK AVERAGE STATISTICS

			HOURS			MINUTES	
		MOVE	DELAY	TOTAL	AVERAGE	MOVE	DELAY
	VMT	TIME	TIME	TIME	SPEED	PER MILE	PER MILE
BASE YEAR	14594.43	263.30	57.16	320.45	45.53	1.32	0.24
NO BUILD 2021	25801.42	458.06	126.83	584.88	44.12	1.36	0.29
NO BUILD 2031	30035.01	532.97	242.44	775.42	38.75	1.55	0.49
EAST FRWY 2021	30408.31	502.13	36.96	539.09	56.41	0.93	0.07
EAST FRWY 2031	36292.26	590.30	46.46	636.76	56.99	0.93	0.08
VE3 2021	33565.56	549.17	40.24	589.41	56.95	0.93	0.07
VE3 2031	36349.54	591.12	46.34	637.46	57.02	0.93	0.08
VW2VE2 2021	28824.17	479.32	36.14	515.46	55.92	0.93	0.07
VW2VE2 2031	35002.17	584.47	50.79	635.26	55.10	0.92	0.09
VW3 2021	28718.22	476.89	33.70	510.59	56.25	0.93	0.07
VW3 2031	34479.75	572.34	46.67	619.01	55.70	0.92	0.08

* INCLUDES RAMP STATISTICS

Appendix C – Speed/Travel Time Calculation/Comparison

HOPLAND BYPASS

Average Travel Time
From South IC to McNab IC

Alternatives

		Distance	Time
VW3	2021	7.53	7.19
	2031	7.53	7.24
VW2/VE2	2021	7.42	7.11
	2031	7.42	7.12
VE3	2021	7.38	7.01
	2031	7.38	7.06
EFRWY	2021	7.97	7.58
	2031	7.97	7.63

	Average Distance	Average Time
2021	7.57	7.22
2031	7.57	7.26

Old US 101

		Distance	Time	
Base Year	NB	7.56	9.70	
	SB	7.56	9.19	9.446143
2021	NB	7.56	10.24	
	SB	7.56	9.76	9.999788
2031	NB	7.56	11.00	
	SB	7.56	9.85	10.42837

NB/SB Combined Average

	Distance	Time
2021	7.56	10.00
2031	7.56	10.43

Comparison

	Old 101	Bypass	Time Save
2021	10.00	7.22	**2.78**
2031	10.43	7.26	**3.17**

2021

North Hopland Expressway Alternative

Average Simulated Trave

SIMULATION RUNS -SPEED

	Links		a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	Avg Spd	Weighted Avg. Spd SB	NB	
SB	44	1	60.80	60.70	61.80	61.00	61.20	61.00	60.20	60.10	60.00	60.30	60.71	46200.31		
NB	1	44	60.50	60.00	59.80	59.70	60.30	60.10	60.20	60.00	60.00	59.70	60.03		45682.83	
SB	1	2	59.50	59.20	60.10	58.70	59.80	59.10	58.30	58.40	58.70	57.90	58.97	72061.34		
NB	2	1	57.80	57.50	57.90	57.60	58.20	57.80	58.20	57.50	57.60	57.90	57.8		70631.6	
SB	2	5	59.30	59.40	58.20	59.50	59.40	59.00	58.60	58.50	58.60	58.70	58.92	122200.08		
NB	5	2	59.00	58.00	60.20	57.50	58.40	58.80	59.10	58.00	58.90	58.50	58.64		121619.36	
SB	5	51	60.70	60.90	61.40	60.70	60.70	60.70	60.30	60.20	60.10	60.40	60.61	139039.34		
NB	51	5	56.70	57.00	54.30	56.10	57.60	57.20	55.50	57.40	56.80	54.00	56.26		129060.44	
SB	51	6	60.60	60.40	60.70	60.00	60.30	60.10	59.60	59.80	59.60	59.90	60.1	174290		
NB	6	51	57.30	57.60	53.80	56.40	57.60	58.30	56.30	57.40	56.90	54.80	56.64		164256	
SB	6	50	59.80	59.60	59.80	59.00	60.20	59.70	58.50	59.30	58.80	59.50	59.42	102618.34		
NB	50	6	59.90	59.90	58.50	58.40	59.30	59.30	59.40	58.40	58.70	58.50	59.03		101944.81	
SB	50	7	59.30	59.30	59.80	58.90	59.60	58.70	57.90	58.80	58.60	58.70	58.96	109783.52		
NB	7	50	58.40	57.70	56.90	56.60	56.40	57.50	58.00	57.20	57.10	57.70	57.35		106785.7	
SB	7	65	60.10	59.30	60.70	59.00	60.10	59.10	58.20	59.30	59.70	59.40	59.49	197090.37		
NB	65	7	59.60	59.40	58.80	58.20	59.30	59.30	59.30	58.80	58.90	58.80	59.04		195599.52	
SB	65	8	60.30	59.50	59.20	58.80	59.80	59.10	58.20	59.40	59.10	59.40	59.28	72084.48		
NB	8	65	59.40	59.50	60.90	58.40	59.20	58.80	59.70	58.90	58.40	59.20	59.24		72035.84	
SB	8	176	60.10	59.90	59.40	59.30	59.70	59.20	58.10	59.50	59.30	59.20	59.37	67206.84		
NB	176	8	59.80	59.70	60.70	58.80	59.50	59.30	59.70	59.00	59.10	59.50	59.51		67365.32	
														59.5954	58.104	Speed/MPH
														0.99326	0.9684	Speed/MPM
														3.52777	3.61832	Travel Time

2031 - Signalized Henry Station Intersection

North Hopland Expressway Alternative

Average Simulated Trave

SIMULATION RUNS -SPEED

	Links		a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	Avg Spd	Weighted Avg. Spd SB	NB	
SB	44	1	59.90	60.00	60.60	60.30	59.90	60.40	60.00	59.90	60.00	60.00	60.1	45736.1		
NB	1	44	54.80	53.80	54.40	55.10	55.00	55.50	54.00	55.20	55.20	54.90	54.79		41695.19	
SB	1	2	39.30	39.00	39.00	38.50	38.80	39.50	38.60	37.80	37.80	39.10	38.74	47340.28		
NB	2	1	45.60	43.00	44.10	45.00	45.80	46.20	43.70	45.80	46.30	44.60	45.01		55002.22	
SB	2	5	50.40	51.30	50.50	50.70	49.50	50.90	49.50	50.10	50.00	51.40	50.43	104591.82		
NB	5	2	42.50	38.60	40.00	41.10	41.80	42.90	42.10	40.90	42.40	41.60	41.39		85842.86	
SB	5	51	57.90	58.20	58.50	58.30	57.60	58.30	57.40	58.70	58.60	58.00	58.15	133396.1		
NB	51	5	51.90	47.70	51.90	52.70	52.70	52.00	51.30	51.50	51.90	49.50	51.31		117705.14	
SB	51	6	57.70	57.80	58.80	58.20	57.50	58.10	57.30	58.50	58.60	57.70	58.02	168258		
NB	6	51	51.10	42.30	48.40	51.30	52.80	50.00	49.50	48.00	50.30	47.00	49.07		142303	
SB	6	50	57.00	56.40	57.50	57.70	56.10	57.50	55.80	57.90	57.60	57.20	57.07	98559.89		
NB	50	6	56.70	57.00	57.00	57.50	57.60	57.20	57.20	56.40	57.10	57.70	57.14		98680.78	
SB	50	7	56.90	56.30	57.70	57.30	56.40	57.60	56.40	57.50	57.50	57.20	57.08	106282.96		
NB	7	50	54.60	55.70	55.70	56.00	54.90	55.70	55.90	54.70	56.00	56.10	55.53		103396.86	
SB	7	65	57.90	57.70	58.90	57.90	57.60	58.70	56.90	58.30	57.90	58.10	57.99	192120.87		
NB	65	7	57.50	57.80	57.50	57.60	57.90	57.90	57.70	56.30	57.70	57.90	57.58		190762.54	
SB	65	8	58.00	57.80	58.70	58.10	57.40	58.20	57.10	58.20	57.90	57.80	57.92	70430.72		
NB	8	65	58.20	58.10	57.80	57.20	57.90	58.20	58.00	57.20	57.80	57.70	57.81		70296.96	
SB	8	176	57.60	57.50	59.00	57.80	57.50	58.20	57.10	58.50	57.90	57.90	57.9	65542.8		
NB	176	8	58.70	58.60	58.30	58.00	58.30	58.70	58.50	57.70	58.30	58.60	58.37		66074.84	
														55.7948	52.5247	Speed/MPH
														0.92991	0.87541	Speed/MPM
														3.76807	4.00266	Travel Time

Appendix D – CDROM –HCS/SIGCinema Worksheets